

GNU FreeIPMI User's Guide

Free Intelligent Platform Management System
Version 0.1.0 updated on 8 October 2004

by Anand Babu ab@gnu.org.in

Copyright © 2004 FreeIPMI Core Team

Permission is granted to make and distribute verbatim copies of this manual provided the copyright notice and this permission notice are preserved on all copies.

Permission is granted to copy and distribute modified versions of this manual under the conditions for verbatim copying, provided that the entire resulting derived work is distributed under the terms of a permission notice identical to this one.

Permission is granted to copy and distribute translations of this manual into another language, under the above conditions for modified versions, except that this permission notice may be stated in a translation approved by the Foundation.

Short Contents

1	Introduction to the GNU FreeIPMI system	1
2	Installing GNU FreeIPMI	2
3	IPMI C library (libfreeipmi)	4
4	FISH FreeIPMI SHell	5
5	bmc-config	8
6	bmc-info	15
7	sensors	16
8	sel	58
9	bmc-watchdog	61
10	IPMI power control utility	66
11	ipmiping	74
12	rmcpping	76
13	Trouble-shooting	78
14	Contact us	80
15	Authors	81
16	Copying	82
17	Glossary	95
	Concept index	96
	Program index	97

Table of Contents

1	Introduction to the GNU FreeIPMI system..	1
1.1	Who should read this guide?	1
1.2	IPMI - Platform Management Standard	1
2	Installing GNU FreeIPMI	2
2.1	Dependencies	2
2.2	Building the source package	2
2.3	Test Fire	2
3	IPMI C library (libfreeipmi)	4
4	FISH FreeIPMI SHell	5
4.1	Command-line arguments to fish	5
4.2	Setting default startup options	5
4.3	Invoking fish	6
4.3.1	fish as shell	6
4.3.2	Fish as script interpreter	6
4.3.3	Fish extensions	7
5	bmc-config	8
5.1	Command-line arguments to bmc-config	8
5.2	Sample Configuration File	8
5.3	Extracting current BMC configuration	14
5.4	Update BMC configuration	14
5.5	Compare BMC configuration	14
6	bmc-info	15
6.1	Command-line options	15
6.2	Example	15
7	sensors	16
7.1	command-line arguments	16
7.2	Setting default startup options	16
7.3	sensors in action	17
7.3.1	Sample sensors output	17
7.3.2	Sample very-verbose output	19
8	sel	58
8.1	command-line arguments	58
8.2	sel sample output	58

9	bmc-watchdog	61
9.1	BMC Watchdog Theory	61
9.2	command-line arguments	61
9.2.1	bmc-watchdog general options	61
9.2.2	bmc-watchdog command options	62
9.2.3	bmc-watchdog set options	62
9.2.4	bmc-watchdog start options	63
9.2.5	bmc-watchdog daemon options	64
9.3	bmc-watchdog example	65
9.4	bmc-watchdog known issues	65
10	IPMI power control utility	66
10.1	Command-line arguments	66
10.1.1	ipmipower basic options	66
10.1.2	ipmipower advanced options	67
10.1.3	ipmipower network options	67
10.2	ipmipower configuration file	69
10.2.1	Configuration options	69
10.3	ipmipower interactive commands	70
10.4	Host ranges	72
10.5	ipmipower example	72
10.6	Use with powerman	73
10.7	Known issues with the ipmipower command	73
11	ipmiping	74
11.1	command-line arguments	74
11.1.1	Synopsis	74
11.2	ipmiping example	74
11.3	ipmiping known issues	75
12	rmcpping	76
12.1	Command-line arguments	76
12.1.1	Synopsis	76
12.2	rmcpping example	76
12.3	rmcpping known issues	77
13	Trouble-shooting	78
13.1	Fencing IPMI IP ports	78
13.2	“Cat ate the fish” exception	78
13.3	Non-unique IPC key	79
14	Contact us	80
14.0.1	For everything else...	80

15	Authors	81
15.1	FreeIPMI Contributors (sorted alphabetically)	81
15.1.1	Core team	81
15.1.2	Documentation	81
15.1.3	Packaging	81
15.1.4	contact point	81
16	Copying	82
16.1	GNU FreeIPMI license	82
16.1.1	Preamble	82
16.1.2	TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION	83
16.1.2	Appendix: How to Apply These Terms to Your New Programs	87
16.2	GNU FreeIPMI documentation license	88
16.2.1	ADDENDUM: How to use this License for your documents	94
17	Glossary	95
	Concept index	96
	Program index	97

1 Introduction to the GNU FreeIPMI system

GNU FreeIPMI is a Free Intelligent Platform Management System Software. It provides “Remote-Console” (out-of-band), “System Management Software” (in-band) and a development library conforming to Intelligent Platform Management Interface (IPMI v1.5) standards.

GNU FreeIPMI User’s Guide concentrates installation, usage, troubleshooting and bug reporting. It corresponds to 0.1.0 release.

1.1 Who should read this guide?

If you want to use the *Intelligent Platform Management Interface* functionalities available on modern motherboards running GNU or any POSIX compliant operating systems, this guide is right for you.

1.2 IPMI - Platform Management Standard

The IPMI specifications define standardized, abstracted interfaces to the platform management subsystem. IPMI includes the definition of interfaces for extending platform management between board within the main chassis, and between multiple chassis.

The term platform management is used to refer to the monitoring and control functions that are built in to the platform hardware and primarily used for the purpose of monitoring the health of the system hardware. This typically includes monitoring elements such as system temperatures, voltages, fans, power supplies, bus errors, system physical security, etc. It includes automatic and manually driven recovery capabilities such as local or remote system resets and power on/off operations. It includes the logging of abnormal or out-of-range conditions for later examination and alerting where the platform issues the alert without aid of run-time software. Lastly it includes inventory information that can help identify a failed hardware unit.

2 Installing GNU FreeIPMI

You can obtain copies of source, binary, documentation and other useful information from the [GNU FreeIPMI Home Page](#).

2.1 Dependencies

GNU FreeIPMI is designed to have minimum dependencies on other libraries and tools. FreeIPMI Shell alone depends on GNU Guile and GNU Readline for the convenience of extension, scripting and GNU Bash like user interface. libfreeipmi library has virtually no dependencies at all.

List of dependencies under Debian GNU/Linux:

- GNU Guile - guile-1.6, guile-1.6-dev
- GNU Readline - libreadline4, libreadline4-dev

List of dependencies under Fedora or RedHat GNU/Linux:

- GNU Guile - guile-1.6.x, guile-devel-1.6.x.
- GNU Readline - readline-4.x, readline-devel-4.x

2.2 Building the source package.

To compile the program, you must first run the `configure` script included with the source tar ball. It works just like any other standard GNU `autoconf` created script. See the more generic configure related installation instructions below.

For complete list of options, try `configure --help`.

Note: Please run `./autogen.sh` script before `./configure`, if you are compiling FreeIPMI source from CVS.

```
# ./configure --prefix=/usr
# make
# make install
```

2.3 Test Fire

GNU FreeIPMI works both in-band (with-in the system) and out-of-band (over the network). Easiest way to test if your system has IPMI support or if the installation is OK is through `bmc-info` command.

Test if IPMI works:

```
debian-ia64:~# bmc-info
Device ID:          20
Device Revision:    1
                  [SDR Support]
Firmware Revision: 0.27
                  [Device Available (normal operation)]
IPMI Version:       1.5
Additional Device Support:
                  [Sensor Device]
```



```
[SDR Repository Device]
[SEL Device]
[FRU Inventory Device]
[IPMB Event Receiver]
[Chassis Device]
Manufacturer ID: 157h
Product ID: 100h
Aux Firmware Revision Info: Boot Code v00.13, PIA v01.27
debian-ia64:~#
```

If you don't get the expected response from `bmc-info` command, please refer to [Chapter 13 \[Trouble-shooting\]](#), page 78.

3 IPMI C library (libfreeipmi)

The Core of GNU FreeIPMI system consists of LAN, KCS, SMIC system interface device drivers, all packaged in a single portable C library. Management applications can access the BMC at various levels using higher level IPMI command APIs or raw read/write interface to the driver.

Library internally uses SM BIOS and PCI drivers to locate the system interfaces.

You should note that all the device drivers are completely written in user-space. If you already have any in-kernel IPMI drivers loaded, unload them before you launch any GNU FreeIPMI utility. Otherwise there are no other prerequisites.

4 FISH FreeIPMI SHell

Fish provides shell, extension/plugin and scripting interface. As a shell, User has access to both in-band and out-of-band access to the host BMC through a rich set of IPMI commands.

Experienced System Administrators can quickly add features or limitlessly customize the system using the extension interface in Scheme language. For example, Pushing System Event Log data to a MySQL server, Triggering alarm upon Platform Chassis Intrusion, Generating email for critical platform events like processor temperature above threshold limit or fan failure or memory errors. . . . In fact, most of the functionalities and commands of this shell are themselves implemented through Fish extensions.

4.1 Command-line arguments to fish

- `—brief`
Shorten output.
- `-q, —quiet, —silent`
Inhibit usual output.
- `—driver-poll-interval=usec`
User *u*sec driver poll interval.
- `-s, —script-file=script-file`
Load and execute given *script-file*.
- `—sms-io-base=sms-io-base`
System Interface Driver SMS IO base address.
- `-v, —verbose`
Print more information.
- `-?, —help`
Give this help list.
- `—usage`
Give a short usage message.
- `-V, —version`
Print program version.

4.2 Setting default startup options

Fish can be customized to great extent using Scheme language interface. You should refer to [\[guile\]](#), page i for advanced options.

Example configuration file: `‘/usr/etc/fish/fish.scm’`

```
;; fish.scm: default fish configuration scm

;; Customize Fish:
(fi-set-prompt! "fish# ")

;; Set driver SMS IO Base port
; (fi-set-sms-io-base! #x0CA2)
```

```
;; Set Driver Internals:
; (fi-set-default-driver-poll-interval 10)

;; Example Group Aliases
; (set! sensors-group-alias-list
;   '(
;     (mysystem . (Processor Fan "Power Supply" Current Memory Chassis))
;     (power . ("Power Supply"))
;     (security . ("Platform Chassis Intrusion Platform Security Violation"))
;   ))
```

4.3 Invoking fish

4.3.1 fish as shell

Fish takes (GNU getopt-long style) command-line arguments and starts as a shell by default with a neat readline interface. You can type `fish` commands at the prompt. Type `--help` to get help on list of available commands and `quit` to exit the shell.

```
fish# debian-ia64:~# fish
FreeIPMI Shell [fish-0.1.0]
Copyright (C) 2003-2004 FreeIPMI Core Team
This program is free software; you may redistribute it under the terms
of the GNU General Public License. This program has absolutely no
warranty.
fish# help sensors
sensors --version --usage --help --verbose --sdr-info --flush-cache
--list-groups --group=GROUP-NAME --sensors "SENSORS-LIST"
        Display IPMI Sensors.

fish# quit
debian-ia64:~#
```

4.3.2 Fish as script interpreter

To start fish as a script interpreter, you can either include script header or invoke with `fish` with `--script-file=SCRIPT-FILE` option.

Example fish self executable script:

```
#!/usr/sbin/fish -s
!#
(bmc-info-main (fi-command-line))
(display "bmc-info exited with [")
(display bmc-info-exit-status)
(display "]" status"\n")
(fi-exit bmc-info-exit-status)
```

Example invoking through command-line:

```
debian-ia64:~# fish --script-file=/root/work/fish-examples/bmc-info.scm
Device ID:          20
```

```

Device Revision: 1
                  [SDR Support]
Firmware Revision: 0.27
                  [Device Available (normal operation)]
IPMI Version: 1.5
Additional Device Support:
                  [Sensor Device]
                  [SDR Repository Device]
                  [SEL Device]
                  [FRU Inventory Device]
                  [IPMB Event Receiver]
                  [Chassis Device]
Manufacturer ID: 157h
Product ID: 100h
Aux Firmware Revision Info: Boot Code v00.13, PIA v01.27
bmc-info exited with 0 status
debian-ia64:~#

```

4.3.3 Fish extensions

Fish extensions are like normal Scheme programming with additional built-in IPMI primitives and procedures. You should refer to [\[guile\]](#), [page i](#) to learn more about writing extensions.

Example fish extension: This simple extension upon loading, will dynamically add `bmc-info` command to the fish shell.

```

;;
;; bmc-info.scm: fish extension to get BMC information.
;;
(define (bmc-info args)
  "Show BMC information"
  (fi-kcs-get-dev-id-display))
(fi-register-command! '("bmc-info" "bmc-info\n\t- Show BMC Information."))

```

Example: Loading the above ‘`bmc-info.scm`’ extension.

```

fish# load /root/work/fish-examples/bmc-info.scm
fish# help bmc-info
bmc-info
      Shows BMC Information.
fish#

```



```

Serial_Enable_Ipmi_Msgs                Yes
## Possible values: Yes/No
Serial_Enable_Link_Auth                Yes
## Possible values: Yes/No
Serial_Enable_Restrict_To_Callback      No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Serial_Privilege_Limit                 User
## Give valid number
Serial_Session_Limit                   0
EndSection
Section User2
## Give username
Username                               ipmiuser
## Give password or leave it blank to clear password
Password
## Possible values: Yes/No
Lan_Enable_Ipmi_Msgs                  Yes
## Possible values: Yes/No
Lan_Enable_Link_Auth                  Yes
## Possible values: Yes/No
Lan_Enable_Restrict_To_Callback        No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Lan_Privilege_Limit                    Administrator
## Give valid number
Lan_Session_Limit                      0
## Possible values: Yes/No
Serial_Enable_Ipmi_Msgs                No
## Possible values: Yes/No
Serial_Enable_Link_Auth                No
## Possible values: Yes/No
Serial_Enable_Restrict_To_Callback      No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Serial_Privilege_Limit                 No_Access
## Give valid number
Serial_Session_Limit                   0
EndSection
Section User3
## Give username
Username                               operator
## Give password or leave it blank to clear password
Password
## Possible values: Yes/No
Lan_Enable_Ipmi_Msgs                  No
## Possible values: Yes/No
Lan_Enable_Link_Auth                  No
## Possible values: Yes/No
Lan_Enable_Restrict_To_Callback        No

```

```

## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Lan_Privilege_Limit                      No_Access
## Give valid number
Lan_Session_Limit                       0
## Possible values: Yes/No
Serial_Enable_Ipmi_Msgs                 No
## Possible values: Yes/No
Serial_Enable_Link_Auth                 No
## Possible values: Yes/No
Serial_Enable_Restrict_To_Callback      No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Serial_Privilege_Limit                  No_Access
## Give valid number
Serial_Session_Limit                    0
EndSection
Section User4
## Give username
Username                                user
## Give password or leave it blank to clear password
Password
## Possible values: Yes/No
Lan_Enable_Ipmi_Msgs                   No
## Possible values: Yes/No
Lan_Enable_Link_Auth                   No
## Possible values: Yes/No
Lan_Enable_Restrict_To_Callback        No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Lan_Privilege_Limit                    No_Access
## Give valid number
Lan_Session_Limit                      0
## Possible values: Yes/No
Serial_Enable_Ipmi_Msgs                No
## Possible values: Yes/No
Serial_Enable_Link_Auth                No
## Possible values: Yes/No
Serial_Enable_Restrict_To_Callback     No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Serial_Privilege_Limit                 No_Access
## Give valid number
Serial_Session_Limit                   0
EndSection
Section LAN_Channel
## Possible values: Disabled/Pre_Boot_Only/Always_Available/Shared
Volatile_Access_Mode                   Always_Available
## Possible values: Yes/No
Volatile_Enable_User_Level_Auth        Yes
## Possible values: Yes/No

```



```

Volatile_Enable_Per_Message_Auth          No
## Possible values: Yes/No
Volatile_Enable_Pef_Alerting               No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Volatile_Channel_Privilege_Limit           User
## Possible values: Disabled/Pre_Boot_Only/Always_Available/Shared
Non_Volatile_Access_Mode                   Always_Available
## Possible values: Yes/No
Non_Volatile_Enable_User_Level_Auth        Yes
## Possible values: Yes/No
Non_Volatile_Enable_Per_Message_Auth       No
## Possible values: Yes/No
Non_Volatile_Enable_Pef_Alerting           No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Non_Volatile_Channel_Privilege_Limit       User
EndSection
Section LAN_Conf
## Possible values: Unspecified/Static/Use_DHCP/Use_BIOS/Use_Others
Ip_Address_Source                         Static
## Give valid IP Address
Ip_Address                                192.168.1.60
## Give valid MAC Address
Mac_Address                               00:0E:0C:21:81:B4
## Give valid Subnet mask
Subnet_Mask                               255.255.255.0
## Give valid IP Address
Default_Gateway_Ip_Address                 192.168.1.1
## Give valid MAC Address
Default_Gateway_Mac_Address                00:00:00:00:00:00
## Give valid IP Address
Backup_Gateway_Ip_Address                   192.168.1.1
## Give valid MAC Address
Backup_Gateway_Mac_Address                 00:00:00:00:00:00
EndSection
Section LAN_Conf_Auth
## Possible values: Yes/No
Callback_Enable_Auth_Type_None             Yes
## Possible values: Yes/No
Callback_Enable_Auth_Type_Md2              Yes
## Possible values: Yes/No
Callback_Enable_Auth_Type_Md5              Yes
## Possible values: Yes/No
Callback_Enable_Auth_Type_Straight_Password Yes
## Possible values: Yes/No
Callback_Enable_Auth_Type_Oem_Proprietary  No
## Possible values: Yes/No
User_Enable_Auth_Type_None                 Yes

```

```

## Possible values: Yes/No
User_Enable_Auth_Type_Md2                Yes
## Possible values: Yes/No
User_Enable_Auth_Type_Md5                Yes
## Possible values: Yes/No
User_Enable_Auth_Type_Straight_Password  Yes
## Possible values: Yes/No
User_Enable_Auth_Type_Oem_Proprietary    No
## Possible values: Yes/No
Operator_Enable_Auth_Type_None           No
## Possible values: Yes/No
Operator_Enable_Auth_Type_Md2            Yes
## Possible values: Yes/No
Operator_Enable_Auth_Type_Md5            Yes
## Possible values: Yes/No
Operator_Enable_Auth_Type_Straight_Password  Yes
## Possible values: Yes/No
Operator_Enable_Auth_Type_Oem_Proprietary  No
## Possible values: Yes/No
Admin_Enable_Auth_Type_None              No
## Possible values: Yes/No
Admin_Enable_Auth_Type_Md2               Yes
## Possible values: Yes/No
Admin_Enable_Auth_Type_Md5               Yes
## Possible values: Yes/No
Admin_Enable_Auth_Type_Straight_Password  Yes
## Possible values: Yes/No
Admin_Enable_Auth_Type_Oem_Proprietary    No
## Possible values: Yes/No
Oem_Enable_Auth_Type_None                No
## Possible values: Yes/No
Oem_Enable_Auth_Type_Md2                 No
## Possible values: Yes/No
Oem_Enable_Auth_Type_Md5                 No
## Possible values: Yes/No
Oem_Enable_Auth_Type_Straight_Password    No
## Possible values: Yes/No
Oem_Enable_Auth_Type_Oem_Proprietary      No
EndSection
Section LAN_Conf_Misc
## Possible values: Yes/No
Enable_Gratuitous_Arps                   Yes
## Possible values: Yes/No
Enable_Arp_Response                      No
## Give valid number
Gratuitous_Arp_Interval                  4
EndSection

```

```

Section Serial_Channel
## Possible values: Disabled/Pre_Boot_Only/Always_Available/Shared
Volatile_Access_Mode                Always_Available
## Possible values: Yes/No
Volatile_Enable_User_Level_Auth      Yes
## Possible values: Yes/No
Volatile_Enable_Per_Message_Auth     No
## Possible values: Yes/No
Volatile_Enable_Pef_Alerting         No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Volatile_Channel_Privilege_Limit     User
## Possible values: Disabled/Pre_Boot_Only/Always_Available/Shared
Non_Volatile_Access_Mode            Always_Available
## Possible values: Yes/No
Non_Volatile_Enable_User_Level_Auth  Yes
## Possible values: Yes/No
Non_Volatile_Enable_Per_Message_Auth No
## Possible values: Yes/No
Non_Volatile_Enable_Pef_Alerting     No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Non_Volatile_Channel_Privilege_Limit User
EndSection
Section Serial_Conf
## Possible values: Yes/No
Enable_Basic_Mode                    Yes
## Possible values: Yes/No
Enable_Ppp_Mode                       Yes
## Possible values: Yes/No
Enable_Terminal_Mode                 No
## Possible Values: Modem_Connect/Direct_Connect
Connect_Mode                         Direct_Connect
## Give valid number
Page_Blackout_Interval               0
## Give valid number
Call_Retry_Time                      60
## Possible values: Yes/No
Enable_Dtr_Hangup                     Yes
## Possible values: No_Flow_Control/RTS_CTS/XON_XOFF
Flow_Control                         No_Flow_Control
## Possible values: 9600/19200/38400/57600/115200
Bit_Rate                             115200
EndSection
Section Misc
## Possible Values: Off_State_AC_Apply/Restore_State_AC_Apply/On_State_AC_Apply
Power_Restore_Policy                 Restore_State_Ac_Apply
EndSection
debian-ia64:~#

```

5.3 Extracting current BMC configuration

‘checkout’ option generates a configuration file containing the current BMC settings. Configuration file is in plain text format with sections enclosing key-value pairs. Comments will guide you to choose appropriate values. Use your favorite editor (like GNU Emacs) to edit these fields. Comment character is ‘#’.

Example: Creating a BMC configuration file.

```
debian-ia64:~# bmc-config --checkout --filename=/tmp/bmc.conf
```

Alternatively you can redirect stdout to the configuration file too.

```
debian-ia64:~# bmc-config --checkout > /tmp/bmc.conf
```

5.4 Update BMC configuration

After customizing the BMC configuration file, you can update the BMC configuration using “commit” option.

Example using configuration file:

```
debian-ia64:~# bmc-config --commit -f /tmp/bmc.conf
```

Example using a specific key:

```
debian-ia64:~# bmc-config --commit -k "LAN_conf:Ip_Address=192.168.1.60"
```

Note: At this point of time, configuration settings can only be fed through a file or key-value pairs and not stdin.

5.5 Compare BMC configuration

To compare the differences between current active BMC settings and the configuration file, use “diff” option

Example: Comparing the configuration file and BMC settings.

```
debian-ia64:~# bmc-config --diff -f /tmp/bmc.conf
USER:Ip_Address=192.168.10.160
BMC :Ip_Address=192.168.1.60 differs
USER:Default_Gateway_Ip_Address=192.168.10.1
BMC :Default_Gateway_Ip_Address=192.168.1.1 differs
USER:Backup_Gateway_Ip_Address=192.168.10.1
BMC :Backup_Gateway_Ip_Address=192.168.1.1 differs
debian-ia64:~# bmc-config --diff -k "User2:Username=guest"
USER:Username=guest
BMC :Username=ipmiuser differs
debian-ia64:~#
```

6 bmc-info

bmc-info command displays BMC/IPMI version information and the list of additional devices supported. This command is mostly used for checking if IPMI is supported or if BMC/FRU/SDR firmware upgrade completed successfully.

6.1 Command-line options

- **-u, --usage**
Usage message.
- **-h, --help**
Show help.
- **-V, --version**
Show version information.

6.2 Example

```
debian-ia64:~# bmc-info
Device ID:          20
Device Revision:    1
                   [SDR Support]
Firmware Revision:  0.27
                   [Device Available (normal operation)]
IPMI Version:       1.5
Additional Device Support:
                   [Sensor Device]
                   [SDR Repository Device]
                   [SEL Device]
                   [FRU Inventory Device]
                   [IPMB Event Receiver]
                   [Chassis Device]
Manufacturer ID:    157h
Product ID:         100h
Aux Firmware Revision Info: Boot Code v00.13, PIA v01.27
debian-ia64:~#
```

7 sensors

sensors utility reports the monitored system health information, such as temperatures and voltages, fan status, etc with nominal, threshold max/min readings and status descriptions.

7.1 command-line arguments

- -u, —usage
Usage message.
- -h, —help
Show help.
- -V, —version
Show version information.
- -v, —verbose
Verbose sensor output.
- -vv
Very verbose sensor output.
- -a, —all
Display all sensors, override ignore list.
- -i, —sdr-info
Show SDR Info.
- -f, —flush-cache
Flush sensor cache.
- -l, —list-groups List the sensor groups.
- -p, —prof Profile system interface driver polling.
- -g *group-name*, —group=*group-name* List sensors from group.
- -s *sensors-list*, —sensors=*sensors-list* List the given sensors.

7.2 Setting default startup options

Example sensors-conf.scm file:

```
;;; file: /usr/etc/fish/sensors-conf.scm

;; sensors-conf.scm: sensors configuration file

;; Sensors cache filename
; (set! sensors-sdr-cache-file "/path/to/cache-filename")

;; Example: Ignore these sensors
; (sensors-ignore! '(54 55 88))

;; Example: Group Aliases
(sensors-group-alias-list-append!
 '(
;   (mysystem . ("Processor" "Fan" "Power Supply" "Current Memory Chassis"))
```

```
(power . ("Power Supply"))
(security . ("Platform Chassis Intrusion" "Platform Security Violation"))
))
```

7.3 sensors in action

CDC 6440 (A.K.A SR870BN4) - a Quad Itanium2 system has 136 sensors on board. GNU FreeIPMI running on Thunder supercomputer monitors 139264 sensors in total.

7.3.1 Sample sensors output

```
debian-ia64:~# sensors
1: I/O Bd +1.3V (Voltage): 1.33 V (low=1.23/nom=1.30/high=1.36) [OK]
2: I/O Bd +1.5V (Voltage): 1.53 V (low=1.42/nom=1.50/high=1.57) [OK]
3: I/O Bd +1.8V (Voltage): 1.82 V (low=1.70/nom=1.80/high=1.88) [OK]
4: I/O Bd +3.3V SB (Voltage): 3.26 V (low=3.13/nom=3.30/high=3.45) [OK]
5: I/O Bd +3.3V_A (Voltage): 3.38 V (low=3.06/nom=3.30/high=3.52) [OK]
6: I/O Bd +3.3V_B (Voltage): 3.38 V (low=3.12/nom=3.30/high=3.46) [OK]
7: IORISER CMOS Bat (Voltage): 3.22 V (low=2.40/nom=2.99/high=3.60) [OK]
8: I/O Bd +5V_A (Voltage): 4.99 V (low=4.73/nom=4.99/high=5.23) [OK]
9: I/O Bd +5V_B (Voltage): 5.03 V (low=4.74/nom=5.00/high=5.23) [OK]
10: I/O Bd +12V (Voltage): 11.97 V (low=11.28/nom=11.90/high=12.46) [OK]
11: I/O Bd -12V (Voltage): -11.99 V (low=-12.64/nom=-12.06/high=-11.49) [OK]
12: Proc Bd +1.2V (Voltage): 1.21 V (low=1.18/nom=1.20/high=1.21) [OK]
13: MEM Bd 1 +1.25V (Voltage): 1.28 V (low=1.18/nom=1.25/high=1.31) [OK]
14: MEM Bd 2 +1.25V (Voltage): 1.28 V (low=1.18/nom=1.25/high=1.31) [OK]
15: Proc Bd +1.3V (Voltage): 1.32 V (low=1.22/nom=1.30/high=1.36) [OK]
16: Proc Bd +1.5V (Voltage): 1.52 V (low=1.45/nom=1.50/high=1.54) [OK]
17: Proc Bd +1.8V (Voltage): 1.82 V (low=1.73/nom=1.80/high=1.87) [OK]
18: Proc Bd +3.3V SB (Voltage): 3.27 V (low=3.13/nom=3.29/high=3.46) [OK]
19: Proc Bd +3.3V (Voltage): 3.30 V (low=3.13/nom=3.29/high=3.46) [OK]
20: IORISER +12V SB (Voltage): 12.33 V (low=11.21/nom=11.80/high=12.39) [OK]
21: IORISER +2.5V (Voltage): 2.50 V (low=2.35/nom=2.47/high=2.60) [OK]
22: IORISER +1.5V SB (Voltage): 1.52 V (low=1.42/nom=1.50/high=1.57) [OK]
23: IORISER +1.5V (Voltage): 1.52 V (low=1.42/nom=1.50/high=1.57) [OK]
24: IORISER +5V SB (Voltage): 4.96 V (low=4.67/nom=4.93/high=5.16) [OK]
25: I/O Bd SCSI +5V (Voltage): 5.04 V (low=4.63/nom=4.99/high=5.33) [OK]
26: Mem Bd 1 Temp (Temperature): 29.00 C (low=10.00/nom=33.00/high=45.00) [OK]
27: Mem Bd 2 Temp (Temperature): 30.00 C (low=10.00/nom=33.00/high=45.00) [OK]
28: I/O Bd Temp 1 (Temperature): 28.00 C (low=10.00/nom=46.00/high=54.00) [OK]
29: I/O Bd SIOH Temp (Temperature): 39.00 C (low=10.00/nom=55.00/high=95.00) [OK]
30: I/O Bd Temp 3 (Temperature): 27.00 C (low=10.00/nom=49.00/high=57.00) [OK]
31: Proc Bd Amb Temp (Temperature): 21.00 C (low=10.00/nom=25.00/high=38.00) [OK]
32: Proc Bd SNC Temp (Temperature): 41.00 C (low=10.00/nom=55.00/high=95.00) [OK]
33: F38 Tach Fan 1 (Fan): 2600.00 RPM (low=2260.00/nom=2600.00/high=2880.00) [OK]
34: F38 Tach Fan 2 (Fan): 2620.00 RPM (low=2260.00/nom=2600.00/high=2880.00) [OK]
35: F25 Tach Fan 3 (Fan): 2480.00 RPM (low=2160.00/nom=2500.00/high=2780.00) [OK]
36: F25 Tach Fan 4 (Fan): 2480.00 RPM (low=2260.00/nom=2620.00/high=2900.00) [OK]
```

37: Mem Bd 1 FanBst (OEM Reserved): 29.00 C (low=10.00/nom=33.00/high=45.00) [OK]
38: Mem Bd 2 FanBst (OEM Reserved): 30.00 C (low=10.00/nom=33.00/high=45.00) [OK]
39: I/O Bd FanBst 1 (OEM Reserved): 28.00 C (low=10.00/nom=46.00/high=54.00) [OK]
40: IOBd SIOH FanBst (OEM Reserved): 39.00 C (low=10.00/nom=55.00/high=95.00) [OK]
41: I/O Bd FanBst 3 (OEM Reserved): 27.00 C (low=10.00/nom=49.00/high=57.00) [OK]
42: Proc Bd Amb FanB (OEM Reserved): 21.00 C (low=10.00/nom=25.00/high=29.00) [OK]
43: Proc Bd SNC FanB (OEM Reserved): 41.00 C (low=10.00/nom=55.00/high=95.00) [OK]
44: Proc 1 Temp (Temperature): 38.00 C (low=15.00/nom=70.00/high=98.00) [OK]
45: Proc 2 Temp (Temperature): N/A (low=15.00/nom=70.00/high=98.00) [Unknown]
46: Proc 3 Temp (Temperature): N/A (low=15.00/nom=70.00/high=98.00) [Unknown]
47: Proc 4 Temp (Temperature): N/A (low=15.00/nom=70.00/high=98.00) [Unknown]
48: Proc 1 FanBst (OEM Reserved): 38.00 C (low=10.00/nom=70.00/high=100.00) [OK]
49: Proc 2 FanBst (OEM Reserved): N/A (low=10.00/nom=70.00/high=100.00) [Unknown]
50: Proc 3 FanBst (OEM Reserved): N/A (low=10.00/nom=70.00/high=100.00) [Unknown]
51: Proc 4 FanBst (OEM Reserved): N/A (low=10.00/nom=70.00/high=100.00) [Unknown]
53: Pwr Unit Status (Power Unit): [OK]
54: Pwr Unit Redund (Power Unit): [OK]
55: Watchdog (Watchdog 2): [OK]
56: Scrtty Violation (Platform Security Violation): [OK]
57: Physical Scrtty (Platform Chassis Intrusion): [OK]
58: POST Error (System Firmware): [OK]
59: Crit Int Status (Critical Interrupt): [OK]
60: EVT Log Disabled (Event Logging Disabled): [OK]
61: System Event (System Event): [OK]
62: Int SCSI TERMV0 (Voltage): [Performance Met]
63: Int SCSI TERMV1 (Voltage): [Performance Met]
64: Int SCSI TERMV2 (Voltage): [Performance Met]
65: Ext SCSI TERMV0 (Voltage): [Performance Met]
66: Ext SCSI TERMV1 (Voltage): [Performance Met]
67: Ext SCSI TERMV2 (Voltage): [Performance Met]
68: Pwr Supply 1 (Power Supply): [OK]
69: Pwr Supply 2 (Power Supply): [OK]
70: IO Bd 3.3V D2D 3 (Power Supply): [OK]
71: IO Bd 3.3V D2D 4 (Power Supply): [OK]
72: IO Bd 5V D2D 1 (Power Supply): [OK]
73: IO Bd 5V D2D 2 (Power Supply): [OK]
74: ProcBd 3.3V D2D1 (Power Supply): [OK]
75: ProcBd 2.5V D2D1 (Power Supply): [OK]
76: ProcBd 2.5V D2D2 (Power Supply): [OK]
77: MemBd1 1.25V D2D (Power Supply): [OK]
78: MemBd2 1.25V D2D (Power Supply): [OK]
79: Proc 12V SB PwGd (Voltage): [Performance Met]
80: Node PwrGd (Voltage): [Performance Met]
81: Mem Bd1 Pres (Board): [Device Inserted/Device Present]
82: Mem Bd2 Pres (Board): [Device Inserted/Device Present]
83: Fan 1 Present (Fan): [Device Inserted/Device Present]
84: Fan 2 Present (Fan): [Device Inserted/Device Present]


```

85: Fan 3 Present (Fan): [Device Inserted/Device Present]
86: Fan 4 Present (Fan): [Device Inserted/Device Present]
87: IO Bd Interlock (Board): [Device Inserted/Device Present]
88: IORISER Interlck (Board): [Device Inserted/Device Present]
89: Proc Bd Interlck (Board): [Device Inserted/Device Present]
90: SCSI Interlock (Board): [Device Inserted/Device Present]
91: INIT State (OEM Reserved): [State Deasserted]
92: Proc 1 Status (Processor): [OK]
93: Proc 2 Status (Processor): [Unknown]
94: Proc 3 Status (Processor): [Unknown]
95: Proc 4 Status (Processor): [Unknown]
96: Proc 1 PwrGd (Voltage): [Performance Met]
97: Proc 2 PwrGd (Voltage): [Unknown]
98: Proc 3 PwrGd (Voltage): [Unknown]
99: Proc 4 PwrGd (Voltage): [Unknown]
100: PCI HP Slot 1 (Slot Connector): [OK]
101: PCI HP Slot 2 (Slot Connector): [OK]
102: PCI HP Slot 3 (Slot Connector): [OK]
103: PCI HP Slot 4 (Slot Connector): [OK]
104: PCI HP Slot 5 (Slot Connector): [OK]
105: PCI HP Slot 6 (Slot Connector): [OK]
106: PCI HP Slot 7 (Slot Connector): [OK]
107: PCI HP Slot 8 (Slot Connector): [OK]
debian-ia64:~#

```

7.3.2 Sample very-verbose output

```

debian-ia64:~# sensors -vv
Record ID: 1
Sensor type: I/O Bd +1.3V (Voltage)
Sensor number: #16
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 1.20 Volts
Upper Critical threshold: 1.39 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 2.55 Volts
Normal min: 1.23 Volts
Nominal reading: 1.30 Volts
Normal max: 1.36 Volts
Sensor reading: 1.33 Volts
Sensor status: OK

Record ID: 2
Sensor type: I/O Bd +1.5V (Voltage)

```

Sensor number: #17
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 1.38 Volts
Upper Critical threshold: 1.61 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 2.55 Volts
Normal min: 1.42 Volts
Nominal reading: 1.50 Volts
Normal max: 1.57 Volts
Sensor reading: 1.53 Volts
Sensor status: OK

Record ID: 3
Sensor type: I/O Bd +1.8V (Voltage)
Sensor number: #18
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 1.66 Volts
Upper Critical threshold: 1.93 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 3.06 Volts
Normal min: 1.70 Volts
Nominal reading: 1.80 Volts
Normal max: 1.88 Volts
Sensor reading: 1.82 Volts
Sensor status: OK

Record ID: 4
Sensor type: I/O Bd +3.3V SB (Voltage)
Sensor number: #21
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 3.04 Volts
Upper Critical threshold: 3.54 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 4.33 Volts
Normal min: 3.13 Volts

Nominal reading: 3.30 Volts
Normal max: 3.45 Volts
Sensor reading: 3.26 Volts
Sensor status: OK

Record ID: 5
Sensor type: I/O Bd +3.3V_A (Voltage)
Sensor number: #22
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 2.94 Volts
Upper Critical threshold: 3.60 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 5.10 Volts
Normal min: 3.06 Volts
Nominal reading: 3.30 Volts
Normal max: 3.52 Volts
Sensor reading: 3.38 Volts
Sensor status: OK

Record ID: 6
Sensor type: I/O Bd +3.3V_B (Voltage)
Sensor number: #23
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 3.04 Volts
Upper Critical threshold: 3.54 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 4.08 Volts
Normal min: 3.12 Volts
Nominal reading: 3.30 Volts
Normal max: 3.46 Volts
Sensor reading: 3.38 Volts
Sensor status: OK

Record ID: 7
Sensor type: IORISER CMOS Bat (Voltage)
Sensor number: #24
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts

Lower Critical threshold: 2.30 Volts
Upper Critical threshold: 3.68 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 4.08 Volts
Normal min: 2.40 Volts
Nominal reading: 2.99 Volts
Normal max: 3.60 Volts
Sensor reading: 3.22 Volts
Sensor status: OK

Record ID: 8
Sensor type: I/O Bd +5V_A (Voltage)
Sensor number: #25
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 4.60 Volts
Upper Critical threshold: 5.36 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 6.63 Volts
Normal min: 4.73 Volts
Nominal reading: 4.99 Volts
Normal max: 5.23 Volts
Sensor reading: 4.99 Volts
Sensor status: OK

Record ID: 9
Sensor type: I/O Bd +5V_B (Voltage)
Sensor number: #26
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.01 Volts
Upper non-recoverable threshold: 0.01 Volts
Lower Critical threshold: 4.61 Volts
Upper Critical threshold: 5.36 Volts
Lower non-critical threshold: 0.01 Volts
Upper non-critical threshold: 0.01 Volts
Sensor min. reading: 0.01 Volts
Sensor max. reading: 6.64 Volts
Normal min: 4.74 Volts
Nominal reading: 5.00 Volts
Normal max: 5.23 Volts
Sensor reading: 5.03 Volts
Sensor status: OK

Record ID: 10
Sensor type: I/O Bd +12V (Voltage)
Sensor number: #27
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 10.97 Volts
Upper Critical threshold: 12.77 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 15.81 Volts
Normal min: 11.28 Volts
Nominal reading: 11.90 Volts
Normal max: 12.46 Volts
Sensor reading: 11.97 Volts
Sensor status: OK

Record ID: 11
Sensor type: I/O Bd -12V (Voltage)
Sensor number: #28
Event/Reading type code: 01h
Lower non-recoverable threshold: -16.60 Volts
Upper non-recoverable threshold: -16.60 Volts
Lower Critical threshold: -13.00 Volts
Upper Critical threshold: -11.20 Volts
Lower non-critical threshold: -16.60 Volts
Upper non-critical threshold: -16.60 Volts
Sensor min. reading: -16.60 Volts
Sensor max. reading: 1.76 Volts
Normal min: -12.64 Volts
Nominal reading: -12.06 Volts
Normal max: -11.49 Volts
Sensor reading: -11.99 Volts
Sensor status: OK

Record ID: 12
Sensor type: Proc Bd +1.2V (Voltage)
Sensor number: #29
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 1.08 Volts
Upper Critical threshold: 1.31 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts

Sensor min. reading: 0.00 Volts
Sensor max. reading: 3.06 Volts
Normal min: 1.18 Volts
Nominal reading: 1.20 Volts
Normal max: 1.21 Volts
Sensor reading: 1.21 Volts
Sensor status: OK

Record ID: 13
Sensor type: MEM Bd 1 +1.25V (Voltage)
Sensor number: #30
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 1.15 Volts
Upper Critical threshold: 1.33 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 3.06 Volts
Normal min: 1.18 Volts
Nominal reading: 1.25 Volts
Normal max: 1.31 Volts
Sensor reading: 1.28 Volts
Sensor status: OK

Record ID: 14
Sensor type: MEM Bd 2 +1.25V (Voltage)
Sensor number: #31
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 1.15 Volts
Upper Critical threshold: 1.33 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 3.06 Volts
Normal min: 1.18 Volts
Nominal reading: 1.25 Volts
Normal max: 1.31 Volts
Sensor reading: 1.28 Volts
Sensor status: OK

Record ID: 15
Sensor type: Proc Bd +1.3V (Voltage)
Sensor number: #32

Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 1.16 Volts
Upper Critical threshold: 1.43 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 3.06 Volts
Normal min: 1.22 Volts
Nominal reading: 1.30 Volts
Normal max: 1.36 Volts
Sensor reading: 1.32 Volts
Sensor status: OK

Record ID: 16
Sensor type: Proc Bd +1.5V (Voltage)
Sensor number: #33
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 1.34 Volts
Upper Critical threshold: 1.64 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 3.06 Volts
Normal min: 1.45 Volts
Nominal reading: 1.50 Volts
Normal max: 1.54 Volts
Sensor reading: 1.52 Volts
Sensor status: OK

Record ID: 17
Sensor type: Proc Bd +1.8V (Voltage)
Sensor number: #34
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 1.62 Volts
Upper Critical threshold: 1.98 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 3.06 Volts
Normal min: 1.73 Volts
Nominal reading: 1.80 Volts

Normal max: 1.87 Volts
Sensor reading: 1.82 Volts
Sensor status: OK

Record ID: 18
Sensor type: Proc Bd +3.3V SB (Voltage)
Sensor number: #35
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 2.99 Volts
Upper Critical threshold: 3.59 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 4.39 Volts
Normal min: 3.13 Volts
Nominal reading: 3.29 Volts
Normal max: 3.46 Volts
Sensor reading: 3.27 Volts
Sensor status: OK

Record ID: 19
Sensor type: Proc Bd +3.3V (Voltage)
Sensor number: #36
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 2.99 Volts
Upper Critical threshold: 3.59 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 4.39 Volts
Normal min: 3.13 Volts
Nominal reading: 3.29 Volts
Normal max: 3.46 Volts
Sensor reading: 3.30 Volts
Sensor status: OK

Record ID: 20
Sensor type: IORISER +12V SB (Voltage)
Sensor number: #37
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 10.80 Volts

Upper Critical threshold: 12.80 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 15.04 Volts
Normal min: 11.21 Volts
Nominal reading: 11.80 Volts
Normal max: 12.39 Volts
Sensor reading: 12.33 Volts
Sensor status: OK

Record ID: 21
Sensor type: IORISER +2.5V (Voltage)
Sensor number: #38
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 2.26 Volts
Upper Critical threshold: 2.69 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 3.75 Volts
Normal min: 2.35 Volts
Nominal reading: 2.47 Volts
Normal max: 2.60 Volts
Sensor reading: 2.50 Volts
Sensor status: OK

Record ID: 22
Sensor type: IORISER +1.5V SB (Voltage)
Sensor number: #39
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 1.37 Volts
Upper Critical threshold: 1.63 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 2.50 Volts
Normal min: 1.42 Volts
Nominal reading: 1.50 Volts
Normal max: 1.57 Volts
Sensor reading: 1.52 Volts
Sensor status: OK

Record ID: 23
Sensor type: IORISER +1.5V (Voltage)
Sensor number: #40
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 1.37 Volts
Upper Critical threshold: 1.63 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 2.50 Volts
Normal min: 1.42 Volts
Nominal reading: 1.50 Volts
Normal max: 1.57 Volts
Sensor reading: 1.51 Volts
Sensor status: OK

Record ID: 24
Sensor type: IORISER +5V SB (Voltage)
Sensor number: #41
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 4.50 Volts
Upper Critical threshold: 5.34 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 7.40 Volts
Normal min: 4.67 Volts
Nominal reading: 4.93 Volts
Normal max: 5.16 Volts
Sensor reading: 4.93 Volts
Sensor status: OK

Record ID: 25
Sensor type: I/O Bd SCSI +5V (Voltage)
Sensor number: #42
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 4.51 Volts
Upper Critical threshold: 5.47 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts

Sensor max. reading: 6.12 Volts
Normal min: 4.63 Volts
Nominal reading: 4.99 Volts
Normal max: 5.33 Volts
Sensor reading: 5.04 Volts
Sensor status: OK

Record ID: 26
Sensor type: Mem Bd 1 Temp (Temperature)
Sensor number: #48
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 5.00 Degrees C
Upper Critical threshold: 53.00 Degrees C
Lower non-critical threshold: 9.00 Degrees C
Upper non-critical threshold: 50.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C
Nominal reading: 33.00 Degrees C
Normal max: 45.00 Degrees C
Sensor reading: 29.00 Degrees C
Sensor status: OK

Record ID: 27
Sensor type: Mem Bd 2 Temp (Temperature)
Sensor number: #49
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 5.00 Degrees C
Upper Critical threshold: 53.00 Degrees C
Lower non-critical threshold: 9.00 Degrees C
Upper non-critical threshold: 50.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C
Nominal reading: 33.00 Degrees C
Normal max: 45.00 Degrees C
Sensor reading: 30.00 Degrees C
Sensor status: OK

Record ID: 28
Sensor type: I/O Bd Temp 1 (Temperature)
Sensor number: #50
Event/Reading type code: 01h

Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 5.00 Degrees C
Upper Critical threshold: 61.00 Degrees C
Lower non-critical threshold: 9.00 Degrees C
Upper non-critical threshold: 58.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C
Nominal reading: 46.00 Degrees C
Normal max: 54.00 Degrees C
Sensor reading: 28.00 Degrees C
Sensor status: OK

Record ID: 29
Sensor type: I/O Bd SIOH Temp (Temperature)
Sensor number: #51
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 5.00 Degrees C
Upper Critical threshold: 105.00 Degrees C
Lower non-critical threshold: 9.00 Degrees C
Upper non-critical threshold: 100.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C
Nominal reading: 55.00 Degrees C
Normal max: 95.00 Degrees C
Sensor reading: 39.00 Degrees C
Sensor status: OK

Record ID: 30
Sensor type: I/O Bd Temp 3 (Temperature)
Sensor number: #52
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 5.00 Degrees C
Upper Critical threshold: 64.00 Degrees C
Lower non-critical threshold: 9.00 Degrees C
Upper non-critical threshold: 61.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C
Nominal reading: 49.00 Degrees C
Normal max: 57.00 Degrees C

Sensor reading: 27.00 Degrees C
Sensor status: OK

Record ID: 31
Sensor type: Proc Bd Amb Temp (Temperature)
Sensor number: #53
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 5.00 Degrees C
Upper Critical threshold: 44.00 Degrees C
Lower non-critical threshold: 9.00 Degrees C
Upper non-critical threshold: 40.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C
Nominal reading: 25.00 Degrees C
Normal max: 38.00 Degrees C
Sensor reading: 21.00 Degrees C
Sensor status: OK

Record ID: 32
Sensor type: Proc Bd SNC Temp (Temperature)
Sensor number: #54
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 5.00 Degrees C
Upper Critical threshold: 105.00 Degrees C
Lower non-critical threshold: 9.00 Degrees C
Upper non-critical threshold: 100.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C
Nominal reading: 55.00 Degrees C
Normal max: 95.00 Degrees C
Sensor reading: 40.00 Degrees C
Sensor status: OK

Record ID: 33
Sensor type: F38 Tach Fan 1 (Fan)
Sensor number: #64
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 RPM
Upper non-recoverable threshold: 0.00 RPM
Lower Critical threshold: 2100.00 RPM
Upper Critical threshold: 0.00 RPM

Lower non-critical threshold: 0.00 RPM
Upper non-critical threshold: 0.00 RPM
Sensor min. reading: 0.00 RPM
Sensor max. reading: 5100.00 RPM
Normal min: 2260.00 RPM
Nominal reading: 2600.00 RPM
Normal max: 2880.00 RPM
Sensor reading: 2620.00 RPM
Sensor status: OK

Record ID: 34
Sensor type: F38 Tach Fan 2 (Fan)
Sensor number: #65
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 RPM
Upper non-recoverable threshold: 0.00 RPM
Lower Critical threshold: 2100.00 RPM
Upper Critical threshold: 0.00 RPM
Lower non-critical threshold: 0.00 RPM
Upper non-critical threshold: 0.00 RPM
Sensor min. reading: 0.00 RPM
Sensor max. reading: 5100.00 RPM
Normal min: 2260.00 RPM
Nominal reading: 2600.00 RPM
Normal max: 2880.00 RPM
Sensor reading: 2600.00 RPM
Sensor status: OK

Record ID: 35
Sensor type: F25 Tach Fan 3 (Fan)
Sensor number: #66
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 RPM
Upper non-recoverable threshold: 0.00 RPM
Lower Critical threshold: 2000.00 RPM
Upper Critical threshold: 0.00 RPM
Lower non-critical threshold: 0.00 RPM
Upper non-critical threshold: 0.00 RPM
Sensor min. reading: 0.00 RPM
Sensor max. reading: 5100.00 RPM
Normal min: 2160.00 RPM
Nominal reading: 2500.00 RPM
Normal max: 2780.00 RPM
Sensor reading: 2480.00 RPM
Sensor status: OK

Record ID: 36

Sensor type: F25 Tach Fan 4 (Fan)
Sensor number: #67
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 RPM
Upper non-recoverable threshold: 0.00 RPM
Lower Critical threshold: 2100.00 RPM
Upper Critical threshold: 0.00 RPM
Lower non-critical threshold: 0.00 RPM
Upper non-critical threshold: 0.00 RPM
Sensor min. reading: 0.00 RPM
Sensor max. reading: 5100.00 RPM
Normal min: 2260.00 RPM
Nominal reading: 2620.00 RPM
Normal max: 2900.00 RPM
Sensor reading: 2500.00 RPM
Sensor status: OK

Record ID: 37
Sensor type: Mem Bd 1 FanBst (OEM Reserved)
Sensor number: #80
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 0.00 Degrees C
Upper Critical threshold: 0.00 Degrees C
Lower non-critical threshold: 0.00 Degrees C
Upper non-critical threshold: 47.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C
Nominal reading: 33.00 Degrees C
Normal max: 45.00 Degrees C
Sensor reading: 29.00 Degrees C
Sensor status: OK

Record ID: 38
Sensor type: Mem Bd 2 FanBst (OEM Reserved)
Sensor number: #81
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 0.00 Degrees C
Upper Critical threshold: 0.00 Degrees C
Lower non-critical threshold: 0.00 Degrees C
Upper non-critical threshold: 47.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C

Normal min: 10.00 Degrees C
Nominal reading: 33.00 Degrees C
Normal max: 45.00 Degrees C
Sensor reading: 30.00 Degrees C
Sensor status: OK

Record ID: 39
Sensor type: I/O Bd FanBst 1 (OEM Reserved)
Sensor number: #82
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 0.00 Degrees C
Upper Critical threshold: 0.00 Degrees C
Lower non-critical threshold: 0.00 Degrees C
Upper non-critical threshold: 56.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C
Nominal reading: 46.00 Degrees C
Normal max: 54.00 Degrees C
Sensor reading: 28.00 Degrees C
Sensor status: OK

Record ID: 40
Sensor type: IOBd SIOH FanBst (OEM Reserved)
Sensor number: #83
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 0.00 Degrees C
Upper Critical threshold: 0.00 Degrees C
Lower non-critical threshold: 0.00 Degrees C
Upper non-critical threshold: 97.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C
Nominal reading: 55.00 Degrees C
Normal max: 95.00 Degrees C
Sensor reading: 39.00 Degrees C
Sensor status: OK

Record ID: 41
Sensor type: I/O Bd FanBst 3 (OEM Reserved)
Sensor number: #84
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C

Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 0.00 Degrees C
Upper Critical threshold: 0.00 Degrees C
Lower non-critical threshold: 0.00 Degrees C
Upper non-critical threshold: 59.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C
Nominal reading: 49.00 Degrees C
Normal max: 57.00 Degrees C
Sensor reading: 27.00 Degrees C
Sensor status: OK

Record ID: 42
Sensor type: Proc Bd Amb FanB (OEM Reserved)
Sensor number: #85
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 0.00 Degrees C
Upper Critical threshold: 0.00 Degrees C
Lower non-critical threshold: 0.00 Degrees C
Upper non-critical threshold: 30.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C
Nominal reading: 25.00 Degrees C
Normal max: 29.00 Degrees C
Sensor reading: 21.00 Degrees C
Sensor status: OK

Record ID: 43
Sensor type: Proc Bd SNC FanB (OEM Reserved)
Sensor number: #86
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 0.00 Degrees C
Upper Critical threshold: 0.00 Degrees C
Lower non-critical threshold: 0.00 Degrees C
Upper non-critical threshold: 97.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C
Nominal reading: 55.00 Degrees C
Normal max: 95.00 Degrees C
Sensor reading: 40.00 Degrees C

Sensor status: OK

Record ID: 44

Sensor type: Proc 1 Temp (Temperature)

Sensor number: #152

Event/Reading type code: 01h

Lower non-recoverable threshold: 0.00 Degrees C

Upper non-recoverable threshold: 0.00 Degrees C

Lower Critical threshold: 2.00 Degrees C

Upper Critical threshold: 112.00 Degrees C

Lower non-critical threshold: 9.00 Degrees C

Upper non-critical threshold: 105.00 Degrees C

Sensor min. reading: -128.00 Degrees C

Sensor max. reading: 127.00 Degrees C

Normal min: 15.00 Degrees C

Nominal reading: 70.00 Degrees C

Normal max: 98.00 Degrees C

Sensor reading: 39.00 Degrees C

Sensor status: OK

Record ID: 45

Sensor type: Proc 2 Temp (Temperature)

Sensor number: #153

Event/Reading type code: 01h

Lower non-recoverable threshold: 0.00 Degrees C

Upper non-recoverable threshold: 0.00 Degrees C

Lower Critical threshold: 2.00 Degrees C

Upper Critical threshold: 112.00 Degrees C

Lower non-critical threshold: 9.00 Degrees C

Upper non-critical threshold: 105.00 Degrees C

Sensor min. reading: -128.00 Degrees C

Sensor max. reading: 127.00 Degrees C

Normal min: 15.00 Degrees C

Nominal reading: 70.00 Degrees C

Normal max: 98.00 Degrees C

Sensor reading: N/A

Sensor status: Unknown

Record ID: 46

Sensor type: Proc 3 Temp (Temperature)

Sensor number: #154

Event/Reading type code: 01h

Lower non-recoverable threshold: 0.00 Degrees C

Upper non-recoverable threshold: 0.00 Degrees C

Lower Critical threshold: 2.00 Degrees C

Upper Critical threshold: 112.00 Degrees C

Lower non-critical threshold: 9.00 Degrees C

Upper non-critical threshold: 105.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 15.00 Degrees C
Nominal reading: 70.00 Degrees C
Normal max: 98.00 Degrees C
Sensor reading: N/A
Sensor status: Unknown

Record ID: 47
Sensor type: Proc 4 Temp (Temperature)
Sensor number: #155
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 2.00 Degrees C
Upper Critical threshold: 112.00 Degrees C
Lower non-critical threshold: 9.00 Degrees C
Upper non-critical threshold: 105.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 15.00 Degrees C
Nominal reading: 70.00 Degrees C
Normal max: 98.00 Degrees C
Sensor reading: N/A
Sensor status: Unknown

Record ID: 48
Sensor type: Proc 1 FanBst (OEM Reserved)
Sensor number: #160
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 0.00 Degrees C
Upper Critical threshold: 0.00 Degrees C
Lower non-critical threshold: 0.00 Degrees C
Upper non-critical threshold: 103.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C
Nominal reading: 70.00 Degrees C
Normal max: 100.00 Degrees C
Sensor reading: 39.00 Degrees C
Sensor status: OK

Record ID: 49
Sensor type: Proc 2 FanBst (OEM Reserved)

Sensor number: #161
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 0.00 Degrees C
Upper Critical threshold: 0.00 Degrees C
Lower non-critical threshold: 0.00 Degrees C
Upper non-critical threshold: 103.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C
Nominal reading: 70.00 Degrees C
Normal max: 100.00 Degrees C
Sensor reading: N/A
Sensor status: Unknown

Record ID: 50
Sensor type: Proc 3 FanBst (OEM Reserved)
Sensor number: #162
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 0.00 Degrees C
Upper Critical threshold: 0.00 Degrees C
Lower non-critical threshold: 0.00 Degrees C
Upper non-critical threshold: 103.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C
Nominal reading: 70.00 Degrees C
Normal max: 100.00 Degrees C
Sensor reading: N/A
Sensor status: Unknown

Record ID: 51
Sensor type: Proc 4 FanBst (OEM Reserved)
Sensor number: #163
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 0.00 Degrees C
Upper Critical threshold: 0.00 Degrees C
Lower non-critical threshold: 0.00 Degrees C
Upper non-critical threshold: 103.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 10.00 Degrees C

Nominal reading: 70.00 Degrees C
Normal max: 100.00 Degrees C
Sensor reading: N/A
Sensor status: Unknown

Record ID: 52
Sensor type: HSC SCSI BP Temp (Temperature)
Sensor number: #1
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Degrees C
Upper non-recoverable threshold: 0.00 Degrees C
Lower Critical threshold: 5.00 Degrees C
Upper Critical threshold: 43.00 Degrees C
Lower non-critical threshold: 10.00 Degrees C
Upper non-critical threshold: 39.00 Degrees C
Sensor min. reading: -128.00 Degrees C
Sensor max. reading: 127.00 Degrees C
Normal min: 12.00 Degrees C
Nominal reading: 28.00 Degrees C
Normal max: 38.00 Degrees C
Sensor reading: 0.00 Degrees C
Sensor status: OK

Record ID: 53
Sensor type: Pwr Unit Status (Power Unit)
Sensor number: #1
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Power Off/Power Down: [OK]
Power Cycle: [OK]
240VA Power Down: [OK]
Interlock Power Down: [OK]
AC lost: [OK]
Soft Power Control Failure: [OK]
Power Unit Failure detected: [OK]
Predictive Failure: [OK]

Record ID: 54
Sensor type: Pwr Unit Redund (Power Unit)
Sensor number: #2
Event/Reading type code: 0Bh
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [OK]

Record ID: 55

Sensor type: Watchdog (Watchdog 2)
Sensor number: #3
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Timer expired, status only (no action, no interrupt): [OK]
Hard Reset: [OK]
Power Down: [OK]
Power Cycle: [OK]
Timer interrupt: [OK]

Record ID: 56
Sensor type: Sctrty Violation (Platform Security Violation)
Sensor number: #4
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Secure Mode (Front Panel Lockout) Violation attempt: [OK]
Pre-boot Password Violation - user password: [OK]
Pre-boot Password Violation attempt - setup password: [OK]
Pre-boot Password Violation - network boot password: [OK]
Other pre-boot Password Violation: [OK]
Out-of-band Access Password Violation: [OK]

Record ID: 57
Sensor type: Physical Sctrty (Platform Chassis Intrusion)
Sensor number: #5
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
General Chassis Intrusion: [OK]
Drive Bay intrusion: [OK]
I/O Card area intrusion: [OK]
Processor area intrusion: [OK]
LAN Leash Lost (system is unplugged from LAN): [OK]
Unauthorized dock/undock: [OK]
FAN area intrusion: [OK]

Record ID: 58
Sensor type: POST Error (System Firmware)
Sensor number: #6
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
System Firmware Error (POST Error): [OK]
System Firmware Hang: [OK]
System Firmware Progress: [OK]

Record ID: 59
Sensor type: Crit Int Status (Critical Interrupt)
Sensor number: #7
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Front Panel NMI/Diagnostic Interrupt: [OK]
Bus Timeout: [OK]
I/O channel check NMI: [OK]
Software NMI: [OK]
PCI PERR: [OK]
PCI SERR: [OK]
EISA Fail Safe Timeout: [OK]
Bus Correctable Error: [OK]
Bus Uncorrectable Error: [OK]
Fatal NMI (port 61h, bit 7): [OK]

Record ID: 60
Sensor type: EVT Log Disabled (Event Logging Disabled)
Sensor number: #9
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Correctable Memory Error Logging Disabled: [OK]
Event 'Type' Logging Disabled: [OK]
Log Area Reset/Cleared: [OK]
All Event Logging Disabled: [OK]
SEL Full: [OK]
SEL Almost Full: [OK]

Record ID: 61
Sensor type: System Event (System Event)
Sensor number: #10
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
System Reconfigured: [OK]
OEM System Boot Event: [OK]
Undetermined system hardware failure: [OK]
Entry added to Auxiliary Log: [OK]
PEF Action: [OK]

Record ID: 62
Sensor type: Int SCSI TERMV0 (Voltage)
Sensor number: #96
Event/Reading type code: 06h

Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Performance Met]

Record ID: 63
Sensor type: Int SCSI TERMV1 (Voltage)
Sensor number: #97
Event/Reading type code: 06h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Performance Met]

Record ID: 64
Sensor type: Int SCSI TERMV2 (Voltage)
Sensor number: #98
Event/Reading type code: 06h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Performance Met]

Record ID: 65
Sensor type: Ext SCSI TERMV0 (Voltage)
Sensor number: #99
Event/Reading type code: 06h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Performance Met]

Record ID: 66
Sensor type: Ext SCSI TERMV1 (Voltage)
Sensor number: #100
Event/Reading type code: 06h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Performance Met]

Record ID: 67
Sensor type: Ext SCSI TERMV2 (Voltage)
Sensor number: #101
Event/Reading type code: 06h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Performance Met]

Record ID: 68
Sensor type: Pwr Supply 1 (Power Supply)
Sensor number: #112

Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Presence detected: [OK]
Power Supply Failure detected: [OK]
Predictive Failure: [OK]
Power Supply AC input lost: [OK]
Power Supply input AC lost or out-of-range: [OK]
Power Supply input AC out-of-range, but present: [OK]
Configuration error: [OK]

Record ID: 69
Sensor type: Pwr Supply 2 (Power Supply)
Sensor number: #113
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Presence detected: [OK]
Power Supply Failure detected: [OK]
Predictive Failure: [OK]
Power Supply AC input lost: [OK]
Power Supply input AC lost or out-of-range: [OK]
Power Supply input AC out-of-range, but present: [OK]
Configuration error: [OK]

Record ID: 70
Sensor type: IO Bd 3.3V D2D 3 (Power Supply)
Sensor number: #116
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Presence detected: [OK]
Power Supply Failure detected: [OK]
Predictive Failure: [OK]
Power Supply AC input lost: [OK]
Power Supply input AC lost or out-of-range: [OK]
Power Supply input AC out-of-range, but present: [OK]
Configuration error: [OK]

Record ID: 71
Sensor type: IO Bd 3.3V D2D 4 (Power Supply)
Sensor number: #117
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Presence detected: [OK]
Power Supply Failure detected: [OK]

Predictive Failure: [OK]
Power Supply AC input lost: [OK]
Power Supply input AC lost or out-of-range: [OK]
Power Supply input AC out-of-range, but present: [OK]
Configuration error: [OK]

Record ID: 72
Sensor type: IO Bd 5V D2D 1 (Power Supply)
Sensor number: #118
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Presence detected: [OK]
Power Supply Failure detected: [OK]
Predictive Failure: [OK]
Power Supply AC input lost: [OK]
Power Supply input AC lost or out-of-range: [OK]
Power Supply input AC out-of-range, but present: [OK]
Configuration error: [OK]

Record ID: 73
Sensor type: IO Bd 5V D2D 2 (Power Supply)
Sensor number: #119
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Presence detected: [OK]
Power Supply Failure detected: [OK]
Predictive Failure: [OK]
Power Supply AC input lost: [OK]
Power Supply input AC lost or out-of-range: [OK]
Power Supply input AC out-of-range, but present: [OK]
Configuration error: [OK]

Record ID: 74
Sensor type: ProcBd 3.3V D2D1 (Power Supply)
Sensor number: #120
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Presence detected: [OK]
Power Supply Failure detected: [OK]
Predictive Failure: [OK]
Power Supply AC input lost: [OK]
Power Supply input AC lost or out-of-range: [OK]
Power Supply input AC out-of-range, but present: [OK]
Configuration error: [OK]

Record ID: 75
Sensor type: ProcBd 2.5V D2D1 (Power Supply)
Sensor number: #121
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Presence detected: [OK]
Power Supply Failure detected: [OK]
Predictive Failure: [OK]
Power Supply AC input lost: [OK]
Power Supply input AC lost or out-of-range: [OK]
Power Supply input AC out-of-range, but present: [OK]
Configuration error: [OK]

Record ID: 76
Sensor type: ProcBd 2.5V D2D2 (Power Supply)
Sensor number: #122
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Presence detected: [OK]
Power Supply Failure detected: [OK]
Predictive Failure: [OK]
Power Supply AC input lost: [OK]
Power Supply input AC lost or out-of-range: [OK]
Power Supply input AC out-of-range, but present: [OK]
Configuration error: [OK]

Record ID: 77
Sensor type: MemBd1 1.25V D2D (Power Supply)
Sensor number: #123
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Presence detected: [OK]
Power Supply Failure detected: [OK]
Predictive Failure: [OK]
Power Supply AC input lost: [OK]
Power Supply input AC lost or out-of-range: [OK]
Power Supply input AC out-of-range, but present: [OK]
Configuration error: [OK]

Record ID: 78
Sensor type: MemBd2 1.25V D2D (Power Supply)
Sensor number: #124
Event/Reading type code: 6Fh

Hysteresis +ve: 0
Hysteresis -ve: 0
Presence detected: [OK]
Power Supply Failure detected: [OK]
Predictive Failure: [OK]
Power Supply AC input lost: [OK]
Power Supply input AC lost or out-of-range: [OK]
Power Supply input AC out-of-range, but present: [OK]
Configuration error: [OK]

Record ID: 79
Sensor type: Proc 12V SB PwGd (Voltage)
Sensor number: #126
Event/Reading type code: 06h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Performance Met]

Record ID: 80
Sensor type: Node PwrGd (Voltage)
Sensor number: #127
Event/Reading type code: 06h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Performance Met]

Record ID: 81
Sensor type: Mem Bd1 Pres (Board)
Sensor number: #128
Event/Reading type code: 08h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Device Inserted/Device Present]

Record ID: 82
Sensor type: Mem Bd2 Pres (Board)
Sensor number: #129
Event/Reading type code: 08h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Device Inserted/Device Present]

Record ID: 83
Sensor type: Fan 1 Present (Fan)
Sensor number: #130
Event/Reading type code: 08h
Hysteresis +ve: 0

Hysteresis -ve: 0
Sensor status: [Device Inserted/Device Present]

Record ID: 84
Sensor type: Fan 2 Present (Fan)
Sensor number: #131
Event/Reading type code: 08h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Device Inserted/Device Present]

Record ID: 85
Sensor type: Fan 3 Present (Fan)
Sensor number: #132
Event/Reading type code: 08h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Device Inserted/Device Present]

Record ID: 86
Sensor type: Fan 4 Present (Fan)
Sensor number: #133
Event/Reading type code: 08h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Device Inserted/Device Present]

Record ID: 87
Sensor type: IO Bd Interlock (Board)
Sensor number: #134
Event/Reading type code: 08h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Device Inserted/Device Present]

Record ID: 88
Sensor type: IORISER Interlck (Board)
Sensor number: #135
Event/Reading type code: 08h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Device Inserted/Device Present]

Record ID: 89
Sensor type: Proc Bd Interlck (Board)
Sensor number: #136
Event/Reading type code: 08h

Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Device Inserted/Device Present]

Record ID: 90
Sensor type: SCSI Interlock (Board)
Sensor number: #137
Event/Reading type code: 08h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Device Inserted/Device Present]

Record ID: 91
Sensor type: INIT State (OEM Reserved)
Sensor number: #138
Event/Reading type code: 03h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [State Deasserted]

Record ID: 92
Sensor type: Proc 1 Status (Processor)
Sensor number: #144
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
IERR: [OK]
Thermal Trip: [OK]
FRB1/BIST failure: [OK]
FRB2/Hang in POST failure: [OK]
FRB3/Processor Startup/Initialization failure: [OK]
Configuration Error: [OK]
SM BIOS 'Uncorrectable CPU-complex Error': [OK]
Processor Presence detected: [OK]
Processor disabled: [OK]
Terminator Presence Detected: [Unknown]
Processor Automatically Throttled: [OK]

Record ID: 93
Sensor type: Proc 2 Status (Processor)
Sensor number: #145
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
IERR: [OK]
Thermal Trip: [OK]
FRB1/BIST failure: [OK]

FRB2/Hang in POST failure: [OK]
FRB3/Processor Startup/Initialization failure: [OK]
Configuration Error: [OK]
SM BIOS 'Uncorrectable CPU-complex Error': [OK]
Processor Presence detected: [Unknown]
Processor disabled: [OK]
Terminator Presence Detected: [Unknown]
Processor Automatically Throttled: [OK]

Record ID: 94
Sensor type: Proc 3 Status (Processor)
Sensor number: #146
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
IERR: [OK]
Thermal Trip: [OK]
FRB1/BIST failure: [OK]
FRB2/Hang in POST failure: [OK]
FRB3/Processor Startup/Initialization failure: [OK]
Configuration Error: [OK]
SM BIOS 'Uncorrectable CPU-complex Error': [OK]
Processor Presence detected: [Unknown]
Processor disabled: [OK]
Terminator Presence Detected: [Unknown]
Processor Automatically Throttled: [OK]

Record ID: 95
Sensor type: Proc 4 Status (Processor)
Sensor number: #147
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
IERR: [OK]
Thermal Trip: [OK]
FRB1/BIST failure: [OK]
FRB2/Hang in POST failure: [OK]
FRB3/Processor Startup/Initialization failure: [OK]
Configuration Error: [OK]
SM BIOS 'Uncorrectable CPU-complex Error': [OK]
Processor Presence detected: [Unknown]
Processor disabled: [OK]
Terminator Presence Detected: [Unknown]
Processor Automatically Throttled: [OK]

Record ID: 96
Sensor type: Proc 1 PwrGd (Voltage)

Sensor number: #164
Event/Reading type code: 06h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Performance Met]

Record ID: 97
Sensor type: Proc 2 PwrGd (Voltage)
Sensor number: #165
Event/Reading type code: 06h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Unknown]

Record ID: 98
Sensor type: Proc 3 PwrGd (Voltage)
Sensor number: #166
Event/Reading type code: 06h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Unknown]

Record ID: 99
Sensor type: Proc 4 PwrGd (Voltage)
Sensor number: #167
Event/Reading type code: 06h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Unknown]

Record ID: 100
Sensor type: PCI HP Slot 1 (Slot Connector)
Sensor number: #224
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Fault Status asserted: [OK]
Identify Status asserted: [OK]
Slot/Connector Device installed/attached: [Unknown]
Slot/Connector Ready for Device Installation: [OK]
Slot/Connector Ready for Device Removal: [OK]
Slot Power is Off: [Unknown]
Slot/Connector Device Removal Request: [OK]
Interlock asserted: [OK]
Slot is Disabled: [OK]
Slot holds spare device: [OK]

Record ID: 101
Sensor type: PCI HP Slot 2 (Slot Connector)
Sensor number: #225
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Fault Status asserted: [OK]
Identify Status asserted: [OK]
Slot/Connector Device installed/attached: [Unknown]
Slot/Connector Ready for Device Installation: [OK]
Slot/Connector Ready for Device Removal: [OK]
Slot Power is Off: [Unknown]
Slot/Connector Device Removal Request: [OK]
Interlock asserted: [OK]
Slot is Disabled: [OK]
Slot holds spare device: [OK]

Record ID: 102
Sensor type: PCI HP Slot 3 (Slot Connector)
Sensor number: #226
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Fault Status asserted: [OK]
Identify Status asserted: [OK]
Slot/Connector Device installed/attached: [Unknown]
Slot/Connector Ready for Device Installation: [OK]
Slot/Connector Ready for Device Removal: [OK]
Slot Power is Off: [Unknown]
Slot/Connector Device Removal Request: [OK]
Interlock asserted: [OK]
Slot is Disabled: [OK]
Slot holds spare device: [OK]

Record ID: 103
Sensor type: PCI HP Slot 4 (Slot Connector)
Sensor number: #227
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Fault Status asserted: [OK]
Identify Status asserted: [OK]
Slot/Connector Device installed/attached: [Unknown]
Slot/Connector Ready for Device Installation: [OK]
Slot/Connector Ready for Device Removal: [OK]
Slot Power is Off: [Unknown]
Slot/Connector Device Removal Request: [OK]

Interlock asserted: [OK]
Slot is Disabled: [OK]
Slot holds spare device: [OK]

Record ID: 104
Sensor type: PCI HP Slot 5 (Slot Connector)
Sensor number: #228
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Fault Status asserted: [OK]
Identify Status asserted: [OK]
Slot/Connector Device installed/attached: [Unknown]
Slot/Connector Ready for Device Installation: [OK]
Slot/Connector Ready for Device Removal: [OK]
Slot Power is Off: [Unknown]
Slot/Connector Device Removal Request: [OK]
Interlock asserted: [OK]
Slot is Disabled: [OK]
Slot holds spare device: [OK]

Record ID: 105
Sensor type: PCI HP Slot 6 (Slot Connector)
Sensor number: #229
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Fault Status asserted: [OK]
Identify Status asserted: [OK]
Slot/Connector Device installed/attached: [Unknown]
Slot/Connector Ready for Device Installation: [OK]
Slot/Connector Ready for Device Removal: [OK]
Slot Power is Off: [Unknown]
Slot/Connector Device Removal Request: [OK]
Interlock asserted: [OK]
Slot is Disabled: [OK]
Slot holds spare device: [OK]

Record ID: 106
Sensor type: PCI HP Slot 7 (Slot Connector)
Sensor number: #230
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Fault Status asserted: [OK]
Identify Status asserted: [OK]
Slot/Connector Device installed/attached: [Unknown]

Slot/Connector Ready for Device Installation: [OK]
Slot/Connector Ready for Device Removal: [OK]
Slot Power is Off: [Unknown]
Slot/Connector Device Removal Request: [OK]
Interlock asserted: [OK]
Slot is Disabled: [OK]
Slot holds spare device: [OK]

Record ID: 107
Sensor type: PCI HP Slot 8 (Slot Connector)
Sensor number: #231
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0
Fault Status asserted: [OK]
Identify Status asserted: [OK]
Slot/Connector Device installed/attached: [Unknown]
Slot/Connector Ready for Device Installation: [OK]
Slot/Connector Ready for Device Removal: [OK]
Slot Power is Off: [Unknown]
Slot/Connector Device Removal Request: [OK]
Interlock asserted: [OK]
Slot is Disabled: [OK]
Slot holds spare device: [OK]

Record ID: 108
Sensor type: HSC Drv 1 Status (Drive Slot)
Sensor number: #2
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0

Record ID: 109
Sensor type: HSC Drv 2 Status (Drive Slot)
Sensor number: #3
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0

Record ID: 110
Sensor type: HSC Drv 3 Status (Drive Slot)
Sensor number: #4
Event/Reading type code: 6Fh
Hysteresis +ve: 0
Hysteresis -ve: 0

Record ID: 111

Sensor type: HSC Drv 1 Pres (Drive Slot)
Sensor number: #9
Event/Reading type code: 08h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [OK]

Record ID: 112
Sensor type: HSC Drv 2 Pres (Drive Slot)
Sensor number: #10
Event/Reading type code: 08h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [OK]

Record ID: 113
Sensor type: HSC Drv 3 Pres (Drive Slot)
Sensor number: #11
Event/Reading type code: 08h
Hysteresis +ve: 0
Hysteresis -ve: 0
Sensor status: [Unknown]

Record ID: 114
Sensor Number: NONE
Container entity ID: 13h
Container entity instance: 01h

Record ID: 115
Sensor Number: NONE
Device type: 09h
Device type modifier: 03h
FRU entity ID: 03h
FRU entity instance: 01h
Device name: Proc 1 INFO FRU

Record ID: 116
Sensor Number: NONE
Device type: 09h
Device type modifier: 03h
FRU entity ID: 03h
FRU entity instance: 02h
Device name: Proc 2 INFO FRU

Record ID: 117
Sensor Number: NONE
Device type: 09h

Device type modifier: 03h
FRU entity ID: 03h
FRU entity instance: 03h
Device name: Proc 3 INFO FRU

Record ID: 118
Sensor Number: NONE
Device type: 09h
Device type modifier: 03h
FRU entity ID: 03h
FRU entity instance: 04h
Device name: Proc 4 INFO FRU

Record ID: 119
Sensor Number: NONE
Device type: 09h
Device type modifier: 02h
FRU entity ID: 03h
FRU entity instance: 05h
Device name: Proc 1 OEM FRU

Record ID: 120
Sensor Number: NONE
Device type: 09h
Device type modifier: 02h
FRU entity ID: 03h
FRU entity instance: 06h
Device name: Proc 2 OEM FRU

Record ID: 121
Sensor Number: NONE
Device type: 09h
Device type modifier: 02h
FRU entity ID: 03h
FRU entity instance: 07h
Device name: Proc 3 OEM FRU

Record ID: 122
Sensor Number: NONE
Device type: 09h
Device type modifier: 02h
FRU entity ID: 03h
FRU entity instance: 08h
Device name: Proc 4 OEM FRU

Record ID: 123
Sensor Number: NONE

Device type: 09h
Device type modifier: 02h
FRU entity ID: 0Ah
FRU entity instance: 01h
Device name: Pwr Supply 1 FRU

Record ID: 124
Sensor Number: NONE
Device type: 09h
Device type modifier: 02h
FRU entity ID: 0Ah
FRU entity instance: 02h
Device name: Pwr Supply 2 FRU

Record ID: 125
Sensor Number: NONE
Device type: 02h
Device type modifier: 00h
FRU entity ID: 12h
FRU entity instance: 01h
Device name: Proc Bd FRU

Record ID: 126
Sensor Number: NONE
Device type: 02h
Device type modifier: 00h
FRU entity ID: 08h
FRU entity instance: 01h
Device name: Mem Bd1 FRU

Record ID: 127
Sensor Number: NONE
Device type: 02h
Device type modifier: 00h
FRU entity ID: 08h
FRU entity instance: 02h
Device name: Mem Bd2 FRU

Record ID: 128
Sensor Number: NONE
Device type: 05h
Device type modifier: 05h
FRU entity ID: 10h
FRU entity instance: 01h
Device name: I/O Bd FRU

Record ID: 129

Sensor Number: NONE
Entity ID: 07h
Entity instance: 01h
Device name: Basebrd Mgt Ctlr

Record ID: 130
Sensor Number: NONE
Entity ID: 0Fh
Entity instance: 01h
Device name: Hot Swap Ctlr

Record ID: 131
Sensor Number: NONE
Entity ID: 07h
Entity instance: 02h
Device name: Chs Bridge Ctlr

Record ID: 132
Sensor Number: NONE
Manufacturer ID: 000157h
OEM Data: 02 02 00 01 70 71

Record ID: 133
Sensor Number: NONE
Manufacturer ID: 000157h
OEM Data: 03 90 40 FC

Record ID: 134
Sensor Number: NONE
Manufacturer ID: 000157h
OEM Data: 54 00 00 50 00 50 00 50 01 07 D0 07 D0 07 D0 02 00 00 00 00 00 00

Record ID: 135
Sensor Number: NONE
Manufacturer ID: 000157h
OEM Data: 53 44 52 20 56 65 72 73 69 6F 6E 20 30 2E 31 38

Record ID: 136
Sensor Number: NONE
Manufacturer ID: 000157h
OEM Data: 53 44 52 20 50 6B 67 2E 20 56 65 72 20 32 2E 30 2E 31 38

debian-ia64:~#

8 sel

BMC provides a centralized, non-volatile System Event Log and logs system events and certain system configuration information to this device. You can perform a postmortem analysis on a system even when the processor(s) are disabled because of a failure. Sel utility helps you view and manage system event log.

8.1 command-line arguments

- -u, —usage
Usage message.
- -h, —help
Show help information.
- -V, —version
Show version information.
- -i, —info
Show SEL header information.
- -x *file*, —hex-dump=*file*
Output raw SEL data in ASCII hex format beginning with the SEL header info.
- -c, —delete-all
Delete all records in the SEL.
- -d REC-LIST, —delete=*rec-list*
Delete this specific list of *rec-list* records in the SEL.

8.2 sel sample output

```

debian-ia64:~# sel
4:30-Dec-2003 00:20:24:Event Logging Disabled #9:Log Area Reset/Cleared:SMI Handler
24:30-Dec-2003 00:23:21:Power Unit #1:Power Unit Failure detected:SMI Handler
124:14-Jan-2004 23:13:11:System Firmware #6:System Firmware Error (POST Error):SMI Handler
144:14-Jan-2004 23:13:13:System Event #8:OEM System Boot Event:BIOS
164:16-Jan-2004 18:41:40:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplugged)
244:16-Jan-2004 22:18:50:System Firmware #6:System Firmware Error (POST Error):SMI Handler
264:16-Jan-2004 22:18:52:System Event #8:OEM System Boot Event:BIOS
284:17-Jan-2004 00:26:49:System Firmware #6:System Firmware Error (POST Error):SMI Handler
304:17-Jan-2004 00:26:50:System Event #8:OEM System Boot Event:BIOS
324:16-Jan-2004 09:53:17:System Firmware #6:System Firmware Error (POST Error):SMI Handler
344:16-Jan-2004 09:53:19:System Event #8:OEM System Boot Event:BIOS
364:23-Jan-2004 05:43:43:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplugged)
384:23-Jan-2004 05:44:06:Power Supply #113:Power Supply AC input lost:SMI Handler
1944:26-May-2004 06:03:53:System Event #8:OEM System Boot Event:BIOS
1964:26-May-2004 06:09:40:Power Unit #1:Power Unit Failure detected:SMI Handler
1984:26-May-2004 06:09:59:Power Unit #1:Soft Power Control Failure:SMI Handler
2124:26-May-2004 06:19:26:Voltage #23:Lower Critical - going low:SMI Handler
2144:26-May-2004 06:20:36:System Event #8:OEM System Boot Event:BIOS
2164:26-May-2004 06:21:15:Power Unit #1:Power Unit Failure detected:SMI Handler
2184:26-May-2004 06:21:30:Power Unit #1:Power Unit Failure detected:SMI Handler

```


2344:26-May-2004 07:39:37:System Event #8:OEM System Boot Event:BIOS
2424:26-May-2004 08:43:19:System Firmware #6:System Firmware Error (POST Error):SMI Ha
2444:26-May-2004 08:43:23:System Event #8:OEM System Boot Event:BIOS
2464:26-May-2004 08:49:43:System Firmware #6:System Firmware Error (POST Error):SMI Ha
2484:26-May-2004 08:49:46:System Event #8:OEM System Boot Event:BIOS
2664:26-May-2004 08:59:35:System Firmware #6:System Firmware Error (POST Error):SMI Ha
2684:26-May-2004 08:59:38:System Event #8:OEM System Boot Event:BIOS
2704:26-May-2004 09:08:42:System Firmware #6:System Firmware Error (POST Error):SMI Ha
2724:26-May-2004 09:08:46:System Event #8:OEM System Boot Event:BIOS
2744:26-May-2004 09:13:33:Board #136:Device Removed/Device Absent:SMI Handler
2824:26-May-2004 09:18:29:System Firmware #6:System Firmware Error (POST Error):SMI Ha
2844:26-May-2004 09:18:33:System Event #8:OEM System Boot Event:BIOS
2884:26-May-2004 09:30:38:System Firmware #6:System Firmware Error (POST Error):SMI Ha
2904:26-May-2004 09:30:42:System Event #8:OEM System Boot Event:BIOS
2924:26-May-2004 09:36:17:System Firmware #6:System Firmware Error (POST Error):SMI Ha
2944:26-May-2004 09:36:20:System Event #8:OEM System Boot Event:BIOS
2964:26-May-2004 09:49:59:Power Supply #112:Power Supply AC input lost:SMI Handler
3004:26-May-2004 10:05:37:System Firmware #6:System Firmware Error (POST Error):SMI Ha
3024:26-May-2004 10:05:40:System Event #8:OEM System Boot Event:BIOS
3064:26-May-2004 10:19:50:System Firmware #6:System Firmware Error (POST Error):SMI Ha
3084:26-May-2004 10:19:54:System Event #8:OEM System Boot Event:BIOS
3124:26-May-2004 10:27:36:System Firmware #6:System Firmware Error (POST Error):SMI Ha
3144:26-May-2004 10:27:39:System Event #8:OEM System Boot Event:BIOS
3164:27-May-2004 02:58:23:Power Supply #113:Power Supply AC input lost:SMI Handler
3224:30-Jun-2004 07:13:20:System Event #8:OEM System Boot Event:BIOS
3244:30-Jun-2004 07:13:49:Fan #65:Lower Critical - going low:SMI Handler
3264:30-Jun-2004 07:13:50:Fan #131:Device Removed/Device Absent:SMI Handler
3284:30-Jun-2004 07:13:53:Fan #131:Device Inserted/Device Present:SMI Handler
3304:30-Jun-2004 07:14:01:Fan #65:Lower Critical - going low:SMI Handler
3324:30-Jun-2004 07:14:01:Fan #67:Lower Critical - going low:SMI Handler
3344:30-Jun-2004 07:14:05:Fan #132:Device Removed/Device Absent:SMI Handler
3364:30-Jun-2004 07:14:08:Fan #132:Device Inserted/Device Present:SMI Handler
3384:30-Jun-2004 07:14:13:Fan #67:Lower Critical - going low:SMI Handler
3404:30-Jun-2004 07:14:23:Fan #130:Device Removed/Device Absent:SMI Handler
3424:30-Jun-2004 07:14:25:Fan #64:Lower Critical - going low:SMI Handler
3444:30-Jun-2004 07:14:25:Fan #65:Lower Critical - going low:SMI Handler
3464:30-Jun-2004 07:14:26:Fan #131:Device Removed/Device Absent:SMI Handler
3484:30-Jun-2004 07:14:32:Fan #130:Device Inserted/Device Present:SMI Handler
3504:30-Jun-2004 07:14:37:Fan #64:Lower Critical - going low:SMI Handler
3524:30-Jun-2004 07:15:02:Fan #131:Device Inserted/Device Present:SMI Handler
3544:30-Jun-2004 07:15:11:Fan #132:Device Removed/Device Absent:SMI Handler
3564:30-Jun-2004 07:15:13:Fan #65:Lower Critical - going low:SMI Handler
3584:30-Jun-2004 07:15:14:Fan #132:Device Inserted/Device Present:SMI Handler
3604:30-Jun-2004 07:15:20:Fan #132:Device Removed/Device Absent:SMI Handler
3624:30-Jun-2004 07:15:23:Fan #132:Device Inserted/Device Present:SMI Handler
3644:30-Jun-2004 07:15:25:Fan #67:Lower Critical - going low:SMI Handler
3664:30-Jun-2004 07:15:26:Fan #133:Device Removed/Device Absent:SMI Handler

```
3684:30-Jun-2004 07:15:29:Fan #132:Device Removed/Device Absent:SMI Handler
3704:30-Jun-2004 07:15:31:Fan #66:Lower Critical - going low:SMI Handler
3724:30-Jun-2004 07:15:41:Fan #132:Device Inserted/Device Present:SMI Handler
3744:30-Jun-2004 07:15:47:Fan #133:Device Inserted/Device Present:SMI Handler
3764:30-Jun-2004 07:15:49:Fan #66:Lower Critical - going low:SMI Handler
3784:30-Jun-2004 07:15:55:Fan #67:Lower Critical - going low:SMI Handler
3804:30-Jun-2004 07:17:00:Power Supply #113:Power Supply AC input lost:SMI Handler
3844:30-Jun-2004 07:21:46:System Firmware #6:System Firmware Error (POST Error):SMI Ha
3864:30-Jun-2004 07:21:48:System Event #8:OEM System Boot Event:BIOS
3884:30-Jun-2004 07:21:57:Power Supply #113:Power Supply AC input lost:SMI Handler
3904:30-Jun-2004 08:29:18:System Event #8:OEM System Boot Event:BIOS
3924:06-Jul-2004 08:54:35:System Event #8:OEM System Boot Event:BIOS
3944:06-Jul-2004 09:02:38:Power Unit #1:Power Unit Failure detected:SMI Handler
3964:31-Dec-1969 16:00:05:Power Unit #1:AC lost:SMI Handler
3984:06-Jul-2004 09:04:03:System Event #8:OEM System Boot Event:BIOS
4004:06-Jul-2004 09:09:07:Power Unit #1:Power Unit Failure detected:SMI Handler
4044:06-Jul-2004 09:10:35:System Event #8:OEM System Boot Event:BIOS
4064:21-Jul-2004 01:15:59:Board #137:Device Removed/Device Absent:SMI Handler
4084:21-Jul-2004 01:16:18:Board #137:Device Inserted/Device Present:SMI Handler
4104:23-Jul-2004 02:51:10:Power Supply #112:Power Supply Failure detected:SMI Handler
4144:23-Jul-2004 02:54:40:System Event #8:OEM System Boot Event:BIOS
4424:25-Aug-2004 10:49:41:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
4444:25-Aug-2004 10:50:19:Power Unit #1:Power Unit Failure detected:SMI Handler
4484:25-Aug-2004 10:53:57:System Event #8:OEM System Boot Event:BIOS
4504:25-Aug-2004 14:14:09:System Event #8:OEM System Boot Event:BIOS
4524:25-Aug-2004 14:26:28:Power Supply #112:Power Supply AC input lost:SMI Handler
4584:26-Aug-2004 13:58:50:System Event #8:OEM System Boot Event:BIOS
4604:27-Aug-2004 15:12:55:Power Supply #113:Power Supply AC input lost:SMI Handler
4644:27-Aug-2004 15:17:45:System Event #8:OEM System Boot Event:BIOS
4684:27-Aug-2004 16:33:03:System Event #8:OEM System Boot Event:BIOS
4704:27-Aug-2004 19:11:41:Power Supply #113:Power Supply AC input lost:SMI Handler
4724:27-Aug-2004 19:11:41:Power Unit #1:Power Unit Failure detected:SMI Handler
4784:27-Aug-2004 19:14:42:System Event #8:OEM System Boot Event:BIOS
4804:30-Aug-2004 12:54:01:System Event #8:OEM System Boot Event:BIOS
4824:07-Sep-2004 13:09:39:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
4844:07-Sep-2004 13:10:33:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
4864:13-Sep-2004 10:00:49:System Firmware #6:System Firmware Error (POST Error):SMI Ha
4884:13-Sep-2004 10:00:51:System Event #8:OEM System Boot Event:BIOS
4904:13-Sep-2004 11:59:02:Power Unit #1:Power Unit Failure detected:SMI Handler
4944:13-Sep-2004 13:22:20:System Firmware #6:System Firmware Error (POST Error):SMI Ha
4964:13-Sep-2004 13:22:22:System Event #8:OEM System Boot Event:BIOS
4984:13-Sep-2004 13:24:56:Power Unit #1:Power Unit Failure detected:SMI Handler
5024:13-Sep-2004 13:29:43:System Firmware #6:System Firmware Error (POST Error):SMI Ha
5044:13-Sep-2004 13:29:45:System Event #8:OEM System Boot Event:BIOS
debian-ia64:~#
```

9 bmc-watchdog

bmc-watchdog is a daemon and configuration utility for BMC watchdog timer. When run as a daemon, it periodically resets the timer so that, should the system lock up, the BMC can perform an appropriate emergency recovery action.

The **bmc-watchdog** tool typically executes as a cronjob or daemon to manage the watchdog timer. A user must be root in order to run **bmc-watchdog**.

9.1 BMC Watchdog Theory

A BMC watchdog timer is part of the Intelligent Platform Management Interface (IPMI) specification and is only available to BMCs that are compliant with IPMI. When a BMC watchdog timer is started, it begins counting down to zero from some positive number of seconds. When the timer hits zero, the timer will execute a pre-configured pre-timeout interrupt and/or timeout action.

In order to stop the pre-timeout interrupt or timeout action from being generated, the watchdog timer must be periodically reset back to its initial beginning value.

The BMC watchdog timer automatically stops itself when the machine is rebooted. Therefore, when a machine is brought up, the BMC watchdog timer must be setup again before it can be used.

Typically, a BMC watchdog timer is used to automatically reset a machine that has crashed. When the operating system first starts up, the BMC timer is set to its initial countdown value. At periodic intervals, when the operating system is functioning properly, the watchdog timer can be reset by the OS or a userspace program. Thus, the timer never counts down to zero. When the system crashes, the timer cannot be reset by the OS or userspace program. Eventually, the timer will countdown to zero and reset the machine.

9.2 command-line arguments

9.2.1 bmc-watchdog general options

The following commands are available to **bmc-watchdog**.

The following options can be used by any command.

- **-h, —help**
Display the help menu. If a specific command (**--set**, **--get**, **--reset**, **--start**, **--stop**, **--clear**, or **--daemon**) is listed on the command line, only the specific options for that command will be listed.
- **-v, —version**
Display the version information.
- **-o int, —io-port=int**
Identify the System Base Address for KCS SMS/IO. By default, '0x0CA2' is used. Port '0x8A2' is also common. If the io-port number is prefixed with a '0x', it is assumed to be a base-16 integer. Otherwise, it is assumed to be a base-10 integer.
- **-f string, —logfile=string**
Specify an alternate logfile from the default of `'/var/log/freeipmi/bmc-watchdog.log'`.

- `-n, --no-logging` Turns off all logging done by `bmc-watchdog`.

9.2.2 bmc-watchdog command options

The following commands are available to `bmc-watchdog`.

- `-s, --set`
Set BMC Watchdog Configuration. BMC watchdog timer configuration values can be set using the set command options listed below under [Section 9.2.3 \[bmc-watchdog set options\]](#), page 62. If a particular configuration parameter is not specified on the command line, the current configuration of that parameter will not be changed.
- `-g, --get`
Get BMC watchdog configuration and state. The current configuration and state is printed to standard output.
- `-r, --reset`
Reset BMC watchdog timer.
- `-t, --start`
Start BMC watchdog timer identical to `--reset` command when the timer is stopped. Does nothing if the timer is currently running.
- `-y, --stop`
Stop BMC watchdog timer. Stops the current timer.
- `-c, --clear`
Clear BMC watchdog configuration. Clears all configuration values for the watchdog timer, except for timer use, which is kept at its current value.
- `-d, --daemon`
Run `bmc-watchdog` as a daemon. Configurable BMC watchdog timer options are listed below under [Section 9.2.5 \[bmc-watchdog daemon options\]](#), page 64. The configuration values are set once, then the daemon will reset the timer at specified periodic intervals. Every time the BMC watchdog timer is reset, a log entry will be generated in the ‘`bmc-watchdog`’ log. The default log is stored at ‘`/var/log/freeipmi/bmc-watchdog.log`’. The daemon can be stopped using the ‘`--stop`’ command, ‘`--clear`’ command, or by setting the ‘`stop_timer`’ flag on the ‘`--set`’ command.

9.2.3 bmc-watchdog set options

The following options can be used by the set command to set or clear various BMC watchdog configuration parameters.

- `-u int, --timer-use=int`
Set timer use. The timer use value can be set to one of the following:
 - ‘1’ = BIOS FRB2
 - ‘2’ = BIOS POST
 - ‘3’ = OS_LOAD
 - ‘4’ = SMS OS
 - ‘5’ = OEM
- `-m int, --stop-timer=int`
Set stop timer flag. A flag value of ‘0’ stops the current BMC watchdog timer. A value of ‘1’ doesn’t turn off the current watchdog timer.

- `-l int, --log=int`
Set log flag. A flag value of '0' turns logging on. A value of '1' turns logging off.
- `-a int, --timeout-action=int`
Set timeout action. The timeout action can be set to one of the following:
 - '0' = No action
 - '1' = Hard Reset
 - '2' = Power Down
 - '3' = Power Cycle
- `-p int, --pre-timeout-interrupt=int`
Set pre-timeout interrupt. The pre timeout interrupt can be set to one of the following:
 - '0' = None
 - '1' = SMI
 - '2' = NMI
 - '3' = Messaging Interrupt
- `-z secs, --pre-timeout-interval=secs`
Set pre-timeout interval in seconds.
- `-F, --clear-bios-frb2`
Clear BIOS FRB2 Timer Use flag.
- `-P, --clear-bios-post`
Clear BIOS POST Timer Use flag.
- `-L, --clear-os-load`
Clear OS Load Timer Use flag.
- `-S, --clear-sms-os`
Clear SMS/OS Timer Use flag.
- `-O, --clear-oem`
Clear OEM Timer Use Flag.
- `-i secs, --initial-countdown=secs`
Set initial countdown in seconds.
- `-w, --start-after-set`
Start timer after set command if timer is stopped. This is typically used when bmc-watchdog is used as a cronjob. This can be used to automatically start the timer after it has been set the first time.
- `-x, --reset-after-set`
Reset timer after set command if timer is running.
- `-j, --start-if-stopped`
Don't execute set command if timer is stopped, just start timer.
- `-k, --reset-if-running`
Don't execute set command if timer is running, just reset timer. This is typically used when bmc-watchdog is used as a cronjob. This can be used to reset the timer after it has been initially started.

9.2.4 bmc-watchdog start options

The following options can be used by the start command.

- `-G int, --gratuitous-arp=int`
Suspend or don't suspend gratuitous ARPs while the BMC timer is running. A flag value of '1' suspends gratuitous ARPs. A value of '0' will not suspend gratuitous ARPs. If this option is not specified, gratuitous ARPs will not be suspended.
- `-A int, --arp-response=int`
Suspend or don't suspend BMC-generated ARP responses while the BMC timer is running. A flag value of '1' suspends ARP responses. A value of '0' will not suspend ARP responses. If this option is not specified, ARP responses will not be suspended.

9.2.5 bmc-watchdog daemon options

The following options can be used by the daemon command to set the initial BMC watchdog configuration parameters.

- `-u int, --timer-use=int`
Set timer use. The timer use value can be set to one of the following:
 - '1' = BIOS FRB2
 - '2' = BIOS POST
 - '3' = OS_LOAD
 - '4' = SMS OS
 - '5' = OEM
- `-l int, --log=int`
Set Log Flag. A flag value of '0' turns logging on. A value of '1' turns logging off.
- `-a int, --timeout-action=int`
Set timeout action. The timeout action can be set to one of the following:
 - '0' = No action
 - '1' = Hard Reset
 - '2' = Power Down
 - '3' = Power Cycle
- `-p int, --pre-timeout-interrupt=int`
Set pre-timeout interrupt. The pre timeout interrupt can be set to one of the following:
 - '0' = None
 - '1' = SMI
 - '2' = NMI
 - '3' = Messaging Interrupt
- `-z secs, --pre-timeout-interval=secs`
Set pre-timeout interval in seconds.
- `-F, --clear-bios-frb2`
Clear BIOS FRB2 Timer Use flag.
- `-P, --clear-bios-post`
Clear BIOS POST Timer Use flag.
- `-L, --clear-os-load`
Clear OS Load Timer Use flag.
- `-S, --clear-sms-os`
Clear SMS/OS Timer Use flag.

- `-O, --clear-oem`
Clear OEM Timer Use flag.
- `-i secs, --initial-countdown=secs`
Set initial countdown in seconds.
- `-G int, --gratuitous-arp=int`
Suspend or don't suspend gratuitous ARPs while the BMC timer is running. A flag value of '1' suspends gratuitous ARPs. A value of '0' will not suspend gratuitous ARPs. If this option is not specified, gratuitous ARPs will not be suspended.
- `-A int, --arp-response=int`
Suspend or don't suspend BMC-generated ARP responses while the BMC timer is running. A flag value of '1' suspends ARP responses. A value of '0' will not suspend ARP responses. If this option is not specified, ARP responses will not be suspended.
- `-e, --reset-period` Time interval to wait before resetting timer. The default is '60' seconds.

9.3 bmc-watchdog example

Setup a bmc-watchdog daemon that resets the machine after '15 minutes' (900 seconds) if the OS has crashed.¹

```
debian-ia64:~# bmc-watchdog -d -u 4 -p 0 -a 1 -i 900
debian-ia64:~# ps -C bmc-watchdog
  PID TTY          TIME CMD
 1035 ?            00:00:00 bmc-watchdog
debian-ia64:~#
```

9.4 bmc-watchdog known issues

bmc-watchdog may fail to reset the watchdog timer if it is not scheduled properly. It is always recommended that bmc-watchdog be executed with a high scheduling priority.

On some machines, the hardware based SMI Handler may disable a processor after a watchdog timer timeout if the timer use is set to something other than SMS/OS.

¹ see default bmc-watchdog rc script `/etc/init.d/bmc-watchdog` a more complete example.

10 IPMI power control utility

Remote out-of-band chassis control utility to perform power-up, power-down, power-cycle, hard-reset, pulse-diagnostics-interrupt and OS soft shutdown operations.

PowerMan <http://www.llnl.gov/linux/powerman/> now supports `ipmipower` as a remote power control device.

Whenever a power command (`--on`, `--off`, `--cycle`, `--reset`, `--stat`, `--pulse`, or `--soft`) is specified on the command-line, `ipmipower` will run in non-interactive mode. `ipmipower` will attempt to run the power command on all hostnames listed on the command line then exit.

If no power commands are specified on the command line, `ipmipower` will run in interactive mode. Interactive mode gives the user a command-line interface to enter various commands. Details of the interactive command line interface can be found under [Section 10.1.1 \[ipmipower basic options\]](#), page 66 section.

10.1 Command-line arguments

10.1.1 ipmipower basic options

The following options are basic options for `ipmipower`.

- `-h, --hostnames host1,host2,...`
The list of hostname addresses to be controlled by `ipmipower`. The hostnames must resolve to the IP address of the NIC connected to the remote host BMC. If hostnames do not resolve to proper BMC IP addresses, RMCP ping messages will not discover the remote host or power commands will time out. This option is required if a power command (`--on`, `--off`, `--cycle`, `--reset`, or `--stat`, `--pulse`, `--soft`) is specified on the command-line. Hostnames may be specified in a range format; see [Section 10.4 \[Host ranges\]](#), page 72 section.
- `-u, --username name`
Sets the username to use when authenticating with the BMC. The user must have *operator* or *administrator* privilege to run the `--on`, `--off`, `--reset`, `--cycle`, `--pulse`, or `--soft` power control commands. The user needs only *user* privileges to determine the status of the machine through `--stat`. If not specified, a null username (Anonymous Login 'User ID 1') is assumed.
- `-p, --password password`
Sets the *password* to use when authenticating with the BMC. If not specified, a null password is assumed.
- `-n, --on`
Power on the target hosts.
- `-f, --off`
Power off the target hosts.
- `-c, --cycle`
Power cycle the target hosts.
- `-r, --reset`
Reset the target hosts.

- **-s, —stat**
Get power status of the target hosts.
- **-j, —pulse**
Send power diagnostic interrupt to target hosts.
- **-k, —soft**
Initiate a soft-shutdown of the OS via ACPI.
- **-H, —help**
Display the help menu and exit.
- **-V, —version**
Display the version information and exit.
- **-C, —config file**
Specify alternate configuration file.

10.1.2 ipmipower advanced options

The following advanced options are used to change the behavior of `ipmipower`.

- **-a, —authtype *auth-type***
Sets the authentication type to use with `ipmipower`. The currently available authentication types are:

```
'none'
'straight_passwd_key' => (default)
'md2'
'md5'
```

- **-g, —on-if-off**
The IPMI specification does not require the `cycle` or `reset` commands to turn on a machine that is currently powered off. This option will force `ipmipower` to issue a power on command instead of a power cycle or hard reset command if the remote machine's power is currently off.
- **-o, —outputtype *output-type***
Sets the output type to use with `ipmipower`. The currently available output types are:

```
'none'
'newline'    => (default)
'hostlist'
```

Hostlist output can be used to shorten output if the number of nodes in your cluster is quite large. However, hostlist output will only output after the slowest node has completed its power control operation.

10.1.3 ipmipower network options

The following options are used to change the behavior of the actual `ipmipower` network protocol used.

- **-t, —timeout *time-out***
Sets the *time-out* in milliseconds. `ipmipower` uses the *time-out* value to determine when to give up on a power command. If not specified, a default *time-out* of 20000 milliseconds (20 seconds) is used.

- -y, `--retry-timeout` *retry-timeout*

Sets the *retry-timeout* in milliseconds. The IPMI protocol sends a series of packets back and forth to a remote host BMC in order to perform a power control operation. When a response to any individual packet is not received after *retry-timeout* milliseconds, **ipmipower** will retry sending that packet. If not specified, packet retransmissions will occur after '400' milliseconds (0.4 seconds). The value *ms* must be less than the time out length specified with '`--timeout`'. Packet retransmissions can be disabled by setting the *retry-timeout* length to '0'.

Note how this option differs from the '`--timeout`' option above. The '`--timeout`' option refers to the entire amount of time the IPMI protocol has to complete a power control operation. The '`--retry`' option refers to the amount of time any individual packet within the IPMI protocol has to complete.

- -b, `--retry-backoff-count` *retry-backoff-count*

After every *retry-backoff-count* retransmissions, **ipmipower** will increase the *retry-timeout* length by another factor for the duration of the current power control operation. This is done to reduce network traffic and allow BMC buffers to empty. If not specified, *retry-backoff-count* is '8'. Retransmission backoff can be disabled by setting the retry backoff count to '0'.

- -i, `--ping-interval` *ping-interval*

- -z, `--ping-timeout` *ping-timeout*

ipmipower will send RMCP ping discovery messages every *ping-interval* milliseconds to discover all remote hosts and confirm its support of IPMI. Power commands cannot be sent to a host until it is discovered. If a remote host does not respond within *ping-timeout* milliseconds, a host will be considered undiscovered and power commands will not be sent to it. If not specified, *ping-interval* is '5000' milliseconds (5 seconds) and *ping-timeout* is '30000' milliseconds (30 seconds). Ping discovery requests can be disabled by setting the ping interval to '0'. If ping discovery messages are disabled, power commands will be attempted without knowledge of the host's existence or its support of IPMI. The value of *ping-interval* must be less than the *ping-timeout* length. RMCP ping discovery messages are automatically disabled in non-interactive mode.

- -v, `--ping-packet-count` *ping-packet-count*

- -w, `--ping-percent` *ping-percent*

It is difficult to distinguish between a missing node and node with a bad connection when using just RMCP pings and timeouts. For example, if a link consistently drops 80% of the packets to a particular node, a power control operation may have difficulty completing, although a recent pong response makes **ipmipower** believe the node exists and is functioning properly. The '`--ping-packet-count`' and '`--ping-percent`' options alleviate this problem. **ipmipower** will monitor ping packets in *ping-packet-count* chunks. If **ipmipower** does not receive a response to greater than *ping-percent* of those packets, **ipmipower** will assume the link to this node is bad and will not send power control operations to that node until the connection is determined to be reliable. If not specified, *ping-packet-count* is '10' and *ping-percent* is '50'. This heuristic can be disabled by setting either *ping-packet-count* or *ping-percent* to '0'. This feature is not

used if *ping-interval* is set to '0'. Note that the '--ping-percent' option takes an integer as an argument, not a decimal.

- -x, --ping-consec-count *ping-consec-count*
ping-consec-count is another measurement used to determine if a node should be considered discovered, undiscovered, or with a bad connection. If a valid response was received from the last *ping-consec-count* RMCP ping packets, a node will be considered discovered, regardless if *ping-packet-count* and *ping-percent* statistically consider the link to be unreliable. If not specified, *ping-consec-count* is '5'. This feature can be disabled by setting *ping-consec-count* to '0'. This feature is not used if *ping-interval*, '--ping-packet-count', or '--ping-percent' are set to '0'.

10.2 ipmipower configuration file

The **ipmipower** configuration file can be used to set default values to ipmipower when values aren't set on the command line. This allows users to avoid typing in a long list of command line options everytime ipmipower is executed. It can also be used to hide usernames and passwords from the **ps** command. See [Section 10.7 \[ipmipower known issues\]](#), page 73 for details.

By default, the configuration file is stored at '/etc/ipmipower.conf'. But users may select a different configuration file at the command line through the '--config' option.

The user can still override the configuration file values by specifying the options on the command line. The configuration file does not stop a user from specifying certain options.

10.2.1 Configuration options

The following are a list of configuration options that can be specified in the configuration file. Each configuration option must be listed on a separate line. Arguments for an option are separated by any amount of whitespace. Multiple arguments are also separated by whitespace. Comments can be marked by using the pound sign ("##") character, and lines can be continued on the next using backslash ("\").

Note that it is possible to list the username and password in the configuration file. If this data is stored in a configuration file, system administrators should limit access to this file.

- hostnames *host1 host2 host3 ...*

Specify the default hostnames. Multiple hostnames or hostname ranges can be specified by separating each range by whitespace. See [Section 10.4 \[Host ranges\]](#), page 72 for information on hostname ranges. For example, any of the following configuration listings would be acceptable:

```
hostnames host1 host2 host3 foo1 bar1
hostnames host1,host2,host3,foo1,bar1
hostnames host[1-3] foo1 bar1
hostnames host[1-3] foo1,bar1
```

At most 64 hostnames or hostname ranges can be separated by whitespace.

- username *username*
Specify the default *username* to use.

- password *password*
Specify the default *password* to use.
- authtype *authtype*
Specify the default authentication type to use. `ipmipower` currently supports the following authentication types:
 - ‘straight_passwd_key’
 - ‘md2’
 - ‘md5’
- on-if-off enable|disable
- outputtype *outputtype*
Specify the default outputtype type to use. `ipmipower` currently supports the following output types:
 - ‘none’
 - ‘newline’ => (default)
 - ‘hostlist’
- timeout *timeout*
Specify the *timeout* in ms.
- retry-timeout *timeout*
Specify the retry *timeout* in ms. See [Chapter 10 \[ipmipower\], page 66](#) for an explanation on the difference between this is the *timeout* option.
- retry-backoff-count *num*
Specify the retry backoff count.
- ping-interval *interval-length*
Specify the ping *interval-length* in ms.
- ping-timeout *timeout*
Specify the ping *timeout* length in ms.
- ping-packet-count *count*
Specify a new ping packet *count*.
- ping-percent *num*
Specify a new ping percent.
- ping-consec-count *count*
Specify a new ping consec *count*.

10.3 ipmipower interactive commands

`ipmipower` provides the following interactive commands at the ‘`ipmipower>`’ prompt. Before any **power** commands (‘on’, ‘off’, ‘cycle’, ‘reset’, ‘stat’, ‘pulse’, or ‘soft’) can be used, hostnames must be configured into `ipmipower`, either through the command prompt or the `hostnames` command below.

- hostnames *str*
Specify a new set of hosts, no *str* to unconfigure all hosts.
- username *str*
Specify a new username, no *str* for null username.

- password *str*
Specify a new password, no *str* for null password.
- on *host*
Turns on all hosts, or only the specified host.
- off *host*
Turns off all hosts, or only the specified host.
- cycle *host*
Power cycle all hosts, or specified host.
- reset *host*
Hard reset all hosts or specified host.
- stat *host*
Queries power status for all hosts, or only the specified host.
- pulse *host*
Send pulse diagnostic interrupt to all hosts, or only the specified host.
- soft *host*
Initiate a soft-shutdown of the OS via ACPI to all hosts, or only the specified host.
- help
Display the help menu.
- advanced
Display the advanced help menu.
- network
Display the network help menu.
- quit
Quit ipmipower.
- authtype *str*
Specify a new authentication type:
 - ‘none’
 - ‘straight_passwd_key’
 - ‘md2’
 - ‘md5’
- outputtype *str*
Specify a new output type:
 - ‘none’
 - ‘newline’
 - ‘hostlist’
- config
Output the current configuration.
- timeout *ms*
Specify a new timeout length.
- retry-timeout *ms*
Specify a new retry timeout length.
- retry-backoff-count *num*
Specify a new retry backoff count.

- ping-interval *ms*
Specify a new ping interval length.
- ping-timeout *ms*
Specify a new ping timeout length.
- ping-packet-count *num*
Specify a new ping packet count.
- ping-percent *num*
Specify a new ping percent.
- ping-consec-count *num*
Specify a new ping consec count.

10.4 Host ranges

As noted above, `ipmipower` accepts a range of hostnames in the general form: `prefix[n-m,l-k,...]`, where $n < m$ and $l < k$, etc., as an alternative to explicit comma separated lists of hosts. This form should not be confused with regular expression character classes (also denoted by `[]`). For example, `foo[19]` does not represent `foo1` or `foo9`, but rather represents a degenerate range: `foo19`.

This range syntax is meant only as a convenience on clusters with a `prefixNN` naming convention and specification of ranges should not be considered necessary – the list `foo1,foo9` could be specified as such, or by the range `foo[1,9]`.

Some examples of range usage follow:

```
foo[01-05] instead of foo01,foo02,foo03,foo04,foo05
foo[7,9-10] instead of foo7,foo9,foo10
foo[0-3] instead of foo0,foo1,foo2,foo3
```

As a reminder to the reader, some shells will interpret brackets (`[` and `]`) for pattern matching. Depending on your shell, it may be necessary to enclose ranged lists within quotes.

10.5 ipmipower example

Determine the power status of `foo[0-2]` with null username and password.

```
ipmipower -h foo[0-2] --stat
```

Determine the power status of `foo[0-2]` with non-null username and password.

```
ipmipower -h foo[0-2] -u foo -p bar --stat
```

Hard reset nodes `foo[0-2]` with non-null username and password.

```
ipmipower -h foo[0-2] -u foo -p bar --reset
```

Hard reset the nodes configured in a configuration file.

```
ipmipower -C /etc/powerctrl.conf --reset
```

Example `ipmipower` session:

```
debian-sid:~# ipmipower --hostnames debian-ia64 --password "realsecret" --stat
debian-ia64: on
debian-sid:~# ipmipower --hostnames debian-ia64 --password "realsecret" --off
debian-ia64: ok
```

```
debian-sid:~# ipmipower --hostnames debian-ia64 --password "realsecret" --stat
debian-ia64: off
debian-sid:~# ipmipower --hostnames debian-ia64 --password "realsecret" --on
debian-ia64: ok
debian-sid:~#
```

10.6 Use with powerman

The `powerman` device configuration file `'ipmipower.dev'` supplied with `powerman` 1.0.20 and beyond can be used to control one or more instances of `ipmipower` in coprocess mode.

Due to deficiencies within `powerman`, the power control operations `'--on'`, `'--off'`, `'--cycle'`, `'--reset'` will be reported as successful, despite any errors that may occur. The user should use the `'--query'` option to ensure that all remote hosts were successfully powered on or off.

It is recommend that the `'--on-if-off'` option be used with `ipmipower` when it is used in conjunction with `powerman`. This will ensure `ipmipower` behaves similarly to other `powerman` devices.

10.7 Known issues with the ipmipower command

In order to prevent brute force attacks, some BMCs will *lock up* after a number of username, password, or privilege errors. There is no known way to cleanly deal with a *locked up* BMC. The best option is to simply **wait awhile**.

On certain operating systems, if you input your username and password on the command line, the username and password may be discovered by other users when using the `ps` command or looking in the `'/proc'` file system. The most secure solution is to enter the username and password while in interactive mode. If administrators do not wish to type in their username and password at the interactive prompt, they can be listed in a configuration file, in which the access to this file can be limited.

IPMI specifications do not require BMCs to perform a power control operation before returning a completion code to the caller. Therefore, it is possible for `ipmipower` power status queries to initially return information other than what you are expecting. For example, if a `'power off'` operation is performed, a BMC may return a successful completion-code to `ipmipower` before the `'power off'` operation is actually performed. Subsequent power status queries may return `'on'` for several seconds, until the BMC actually performs the `'power off'` operation.

11 ipmiping

IPMI discovery and reachability test tool.

`ipmiping` uses the IPMI `Get Authentication Capabilities` request datagram to elicit an IPMI `Get Authentication Capabilities` response from a remote host. The utility can be used to verify if a remote host supports IPMI.

Returns '0' to the environment if it receives at least '1' response from the remote host. Otherwise, it exists with a value of '1'.

11.1 command-line arguments

11.1.1 Synopsis

`ipmiping` [OPTIONS] destination

The following options are available

- `-h`
Display the help menu.
- `-V`
Display the version information.
- `-c count`
Stop after sending *count* request packets.
- `-i interval`
Wait *interval* seconds between sending each packet. The default is to wait for one second between each packet.
- `-I interface-address`
Set source address to specified *interface-address*. Argument may be numeric IP address or name of device.
- `-t timeout`
Time to wait for a response, in seconds. Default is five seconds.
- `-v`
Verbose Display.

11.2 ipmiping example

Example: Test the BMC reachability of host 'debian-ia64' using IPMI protocol.

```
debian-sid:~# ipmiping debian-ia64
ipmiping debian-ia64 (192.168.1.60)
response received from 192.168.1.60: rq_seq=0
response received from 192.168.1.60: rq_seq=1
response received from 192.168.1.60: rq_seq=2
response received from 192.168.1.60: rq_seq=3
response received from 192.168.1.60: rq_seq=4
response received from 192.168.1.60: rq_seq=5
--- ipmiping debian-ia64 statistics ---
6 requests transmitted, 6 responses received in time, 0.0% packet loss
```

Example: Test the BMC reachability of host 'debian-ia64' in verbose mode.


```

debian-sid:~# ipmiping -v debian-ia64
ipmiping debian-ia64 (192.168.1.60)
response received from 192.168.1.60: rq_seq=0, auth: none=set md2=set md5=set passwd=s
response received from 192.168.1.60: rq_seq=1, auth: none=set md2=set md5=set passwd=s
response received from 192.168.1.60: rq_seq=2, auth: none=set md2=set md5=set passwd=s
response received from 192.168.1.60: rq_seq=3, auth: none=set md2=set md5=set passwd=s
response received from 192.168.1.60: rq_seq=4, auth: none=set md2=set md5=set passwd=s
--- ipmiping debian-ia64 statistics ---
5 requests transmitted, 5 responses received in time, 0.0% packet loss

```

Example: Test the BMC reachability of host ‘debian-ia64’ by sending exactly 2 packets.

```

debian-sid:~# ipmiping -c 2 debian-ia64
ipmiping debian-ia64 (192.168.1.60)
response received from 192.168.1.60: rq_seq=0
response received from 192.168.1.60: rq_seq=1
--- ipmiping debian-ia64 statistics ---
2 requests transmitted, 2 responses received in time, 0.0% packet loss
debian-sid:~#

```

11.3 ipmiping known issues

It has been observed that some remote BMCs can get *confused* and delay packet responses if duplicate packets are sent in succession very quickly. For example, this could happen if the user repeatedly executes `ipmiping -c 1 destination` very quickly. There is no known way to cleanly deal with a *confused* BMC. The best option is to simply **wait awhile**.

12 rmcpping

RMCP/IPMI discovery and reachability test tool.

`rmcpping` uses the RMCP ping request datagram to elicit an RMCP pong response from a remote host. The utility can be used to verify if a remote host supports RMCP or IPMI.

Returns 0 to the environment if it receives at least ‘1’ response from the remote host. Otherwise, it exits with a value of ‘1’.

12.1 Command-line arguments

12.1.1 Synopsis

`rmcpping` [OPTIONS] destination

- `-h`
Display the help menu.
- `-V`
Display the version information.
- `-c count`
Stop after sending count ping packets.
- `-i interval`
Wait *interval* seconds between sending each packet. The default is to wait for one second between each packet normally.
- `-I interface-address`
Set source address to specified *interface-address*. Argument may be numeric IP address or name of device.
- `-t timeout`
Time to wait for a response, in seconds. Default is ‘5’ seconds.
- `-v` Verbose display.

12.2 rmcpping example

Example: Test the BMC reachability of host ‘debian-ia64’ using RMCP protocol.

```
debian-sid:~# rmcpping debian-ia64
rmcpping debian-ia64 (192.168.1.60)
pong received from 192.168.1.60: msg_tag=0
pong received from 192.168.1.60: msg_tag=1
pong received from 192.168.1.60: msg_tag=2
pong received from 192.168.1.60: msg_tag=3
pong received from 192.168.1.60: msg_tag=4
pong received from 192.168.1.60: msg_tag=5
pong received from 192.168.1.60: msg_tag=6
pong received from 192.168.1.60: msg_tag=7
pong received from 192.168.1.60: msg_tag=8
--- rmcpping debian-ia64 statistics ---
 9 pings transmitted, 9 pongs received in time, 0.0% packet loss
```

Example: Test the BMC reachability of host ‘debian-ia64’ in verbose mode.

```
debian-sid:~# rmcpping -v debian-ia64
rmcpping debian-ia64 (192.168.1.60)
pong received from 192.168.1.60: msg_tag=0, ipmi supported
pong received from 192.168.1.60: msg_tag=1, ipmi supported
pong received from 192.168.1.60: msg_tag=2, ipmi supported
pong received from 192.168.1.60: msg_tag=3, ipmi supported
pong received from 192.168.1.60: msg_tag=4, ipmi supported
--- rmcpping debian-ia64 statistics ---
5 pings transmitted, 5 pongs received in time, 0.0% packet loss
```

Example: Test the BMC reachability of host 'debian-ia64' by sending exactly 2 packets.

```
debian-sid:~# rmcpping -c 2 debian-ia64
rmcpping debian-ia64 (192.168.1.60)
pong received from 192.168.1.60: msg_tag=0
pong received from 192.168.1.60: msg_tag=1
--- rmcpping debian-ia64 statistics ---
2 pings transmitted, 2 pongs received in time, 0.0% packet loss
debian-sid:~#
```

12.3 rmcpping known issues

It has been observed that some remote BMCs can get *confused* and delay packet responses if duplicate packets are sent in succession very quickly. For example, this could happen if the user repeatedly executes `rmcpping -c 1 destination` very quickly. There is no known way to cleanly deal with a *confused* BMC. The best option is to simply **wait awhile**.

13 Trouble-shooting

13.1 Fencing IPMI IP ports

Append the following to `/etc/services`:

```
# BMC IPMI/RMCP services
rmcp      623/udp      # Aux Bus Shunt (Primary RMCP Port)
rmcps     664/udp      # Secure Aux Bus (Secondary RMCP Port)
```

BMC internally (at hardware level) uses the above mentioned ports for sending RMCP/IPMI packets. To avoid any conflict with the BMC, Operating System should make sure no other applications or services use these ports for communication. One easy way to do this is to start a simple daemon at the boot time that opens these ports but never uses them.

Most common victims to this issue are Remote-shell (rsh) and NIS services. You will notice “time out” errors under heavy load, when these services run over the BMC reserved ports.

Secure connections to BMC port 664 is not enabled on most BMC implementations by default.

Thanks to Anand Manian (GE Power Systems) for reporting this problem.

13.2 “Cat ate the fish” exception

`fish` throws exception if it encounters any error in its extension system. Most of the times, You will get a clear indicative message from the exception dump.

In this example, Fish throws an exception message, when a built-in primitive is misspelt as `fi-set-prompt!` instead of `fi-set-prompt!`. Unbound-variable ‘tag’ and ‘throw args’ gives you the clue.

```
root@gnu:~/work/freeipmi# fish
```

```
>>--:> >>--:> >>--:> >>--:>
```

```
~ ~   Cat ate the fish!!  ~ ~
```

```
>>--:> >>--:> >>--:> >>--:>
```

```
Fish Exception (gh_standard_handler dump):
```

```
tag      : unbound-variable
```

```
throw args : (#f Unbound variable: ~S (fi-set-prompt!) #f)
```

```
data      : [/usr/etc/fish/fish.scm]
```

```
No backtrace available.
```

```
FreeIPMI Shell [fish-0.1.0]
```

```
Copyright (C) 2003-2004 FreeIPMI Core Team
```

```
This program is free software; you may redistribute it under the terms of
the GNU General Public License. This program has absolutely no warranty.
fish>
```

```
;; file: /usr/etc/fish/fish.scm (fish startup file)
```

```
(fi-set-prompt! "fish# ")
```

```
^---<< Typo, Spell correctly as "fi-set-prompt!"
```

13.3 Non-unique IPC key

Drivers internally use the inode number of `/var/lib/freeipmi/ipckey` to obtain a system wide unique IPC key for locking and synchronization through `ftok` call. It is extremely rare (but possible) for more than one application to conflict with this IPC key, because `ftok` doesn't absolutely guarantee system wide uniqueness.

To regenerate a new system wide unique IPC key, you have to recreate `/var/lib/freeipmi/ipckey` with a new inode number.

Example: Recreating `/var/lib/freeipmi/ipckey` file.

```
debian-ia64:~# touch -f /var/lib/freeipmi/ipckey.new
debian-ia64:~# ls --inode /var/lib/freeipmi/ipckey
2289282 /var/lib/freeipmi/ipckey
debian-ia64:~# ls --inode /var/lib/freeipmi/ipckey.new
2289284 /var/lib/freeipmi/ipckey.new
debian-ia64:~# mv -f /var/lib/freeipmi/ipckey.new
/var/lib/freeipmi/ipckey
debian-ia64:~# ls --inode /var/lib/freeipmi/ipckey
2289284 /var/lib/freeipmi/ipckey
debian-ia64:~#
```

14 Contact us

- Homepage: <http://www.gnu.org/software/freeipmi>
- Project Main: <https://savannah.gnu.org/projects/freeipmi/>
- Download: <https://savannah.gnu.org/files/?group=freeipmi>
- Mailing List: <https://savannah.gnu.org/mail/?group=freeipmi>
- Support: <https://savannah.gnu.org/support/?group=freeipmi>
- Patches: <https://savannah.gnu.org/patch/?group=freeipmi>
- News: <https://savannah.gnu.org/news/?group=freeipmi>
- Bugs: <https://savannah.gnu.org/bugs/?group=freeipmi>
- Tasks: <https://savannah.gnu.org/task/?group=freeipmi>
- CVS: <https://savannah.gnu.org/cvs/?group=freeipmi>

14.0.1 For everything else...

Contact Anand Babu ab@gnu.org.in

15 Authors

15.1 FreeIPMI Contributors (sorted alphabetically)

15.1.1 Core team

1. Albert Chu chu11@llnl.gov
2. Anand Babu ab@gnu.org.in
3. Balamurugan bala.a@californiadigital.com
4. Ian Zimmerman itz@californiadigital.com
5. Jim Garlick garlick@llnl.gov

15.1.2 Documentation

1. Anand Babu ab@gnu.org.in

15.1.3 Packaging

- | | | | |
|----|---------------|--|------------------|
| 1. | Albert Chu | chu11@llnl.gov | RedHat GNU/Linux |
| 2. | Ian Zimmerman | itz@californiadigital.com | Debian GNU/Linux |

15.1.4 contact point

1. Anand Babu ab@gnu.org.in

16 Copying

16.1 GNU FreeIPMI license

Version 2, June 1991

Copyright © 1989, 1991 Free Software Foundation, Inc.
59 Temple Place - Suite 330, Boston, MA 02111-1307, USA

Everyone is permitted to copy and distribute verbatim copies
of this license document, but changing it is not allowed.

16.1.1 Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software—to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

The precise terms and conditions for copying, distribution and modification follow.

16.1.2 TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The “Program”, below, refers to any such program or work, and a “work based on the Program” means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term “modification”.) Each licensee is addressed as “you”.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

1. You may copy and distribute verbatim copies of the Program’s source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:
 - a. You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.
 - b. You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.
 - c. If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:
 - a. Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
 - b. Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
 - c. Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

4. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.
5. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.

6. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.
7. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

8. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.
9. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.
Each version is given a distinguishing version number. If the Program specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.
10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software

which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM “AS IS” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.
12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

16.1.2 Appendix: How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the “copyright” line and a pointer to where the full notice is found.

```
one line to give the program's name and a brief idea of what it does.
Copyright (C) yyyy  name of author
```

```
This program is free software; you can redistribute it and/or modify
it under the terms of the GNU General Public License as published by
the Free Software Foundation; either version 2 of the License, or
(at your option) any later version.
```

```
This program is distributed in the hope that it will be useful,
but WITHOUT ANY WARRANTY; without even the implied warranty of
MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
GNU General Public License for more details.
```

```
You should have received a copy of the GNU General Public License
along with this program; if not, write to the Free Software
Foundation, Inc., 59 Temple Place - Suite 330, Boston, MA 02111-1307, USA.
```

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

```
Gnomovision version 69, Copyright (C) 19yy  name of author
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type 'show w'.
This is free software, and you are welcome to redistribute it
under certain conditions; type 'show c' for details.
```

The hypothetical commands ‘show w’ and ‘show c’ should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than ‘show w’ and ‘show c’; they could even be mouse-clicks or menu items—whatever suits your program.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a “copyright disclaimer” for the program, if necessary. Here is a sample; alter the names:

```
Yoyodyne, Inc., hereby disclaims all copyright interest in the program
‘Gnomovision’ (which makes passes at compilers) written by James Hacker.
```

```
signature of Ty Coon, 1 April 1989
Ty Coon, President of Vice
```

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Library General Public License instead of this License.

16.2 GNU FreeIPMI documentation license

Version 1.2, November 2002

Copyright © 2000,2001,2002 Free Software Foundation, Inc.
59 Temple Place, Suite 330, Boston, MA 02111-1307, USA

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

0. PREAMBLE

The purpose of this License is to make a manual, textbook, or other functional and useful document *free* in the sense of freedom: to assure everyone the effective freedom to copy and redistribute it, with or without modifying it, either commercially or non-commercially. Secondly, this License preserves for the author and publisher a way to get credit for their work, while not being considered responsible for modifications made by others.

This License is a kind of “copyleft”, which means that derivative works of the document must themselves be free in the same sense. It complements the GNU General Public License, which is a copyleft license designed for free software.

We have designed this License in order to use it for manuals for free software, because free software needs free documentation: a free program should come with manuals providing the same freedoms that the software does. But this License is not limited to software manuals; it can be used for any textual work, regardless of subject matter or whether it is published as a printed book. We recommend this License principally for works whose purpose is instruction or reference.

1. APPLICABILITY AND DEFINITIONS

This License applies to any manual or other work, in any medium, that contains a notice placed by the copyright holder saying it can be distributed under the terms of this License. Such a notice grants a world-wide, royalty-free license, unlimited in duration, to use that work under the conditions stated herein. The “Document”, below, refers to any such manual or work. Any member of the public is a licensee, and is addressed as “you”. You accept the license if you copy, modify or distribute the work in a way requiring permission under copyright law.

A “Modified Version” of the Document means any work containing the Document or a portion of it, either copied verbatim, or with modifications and/or translated into another language.

A “Secondary Section” is a named appendix or a front-matter section of the Document that deals exclusively with the relationship of the publishers or authors of the Document to the Document’s overall subject (or to related matters) and contains nothing that could fall directly within that overall subject. (Thus, if the Document is in part a textbook of mathematics, a Secondary Section may not explain any mathematics.) The relationship could be a matter of historical connection with the subject or with related matters, or of legal, commercial, philosophical, ethical or political position regarding them.

The “Invariant Sections” are certain Secondary Sections whose titles are designated, as being those of Invariant Sections, in the notice that says that the Document is released

under this License. If a section does not fit the above definition of Secondary then it is not allowed to be designated as Invariant. The Document may contain zero Invariant Sections. If the Document does not identify any Invariant Sections then there are none. The “Cover Texts” are certain short passages of text that are listed, as Front-Cover Texts or Back-Cover Texts, in the notice that says that the Document is released under this License. A Front-Cover Text may be at most 5 words, and a Back-Cover Text may be at most 25 words.

A “Transparent” copy of the Document means a machine-readable copy, represented in a format whose specification is available to the general public, that is suitable for revising the document straightforwardly with generic text editors or (for images composed of pixels) generic paint programs or (for drawings) some widely available drawing editor, and that is suitable for input to text formatters or for automatic translation to a variety of formats suitable for input to text formatters. A copy made in an otherwise Transparent file format whose markup, or absence of markup, has been arranged to thwart or discourage subsequent modification by readers is not Transparent. An image format is not Transparent if used for any substantial amount of text. A copy that is not “Transparent” is called “Opaque”.

Examples of suitable formats for Transparent copies include plain ASCII without markup, Texinfo input format, LaTeX input format, SGML or XML using a publicly available DTD, and standard-conforming simple HTML, PostScript or PDF designed for human modification. Examples of transparent image formats include PNG, XCF and JPG. Opaque formats include proprietary formats that can be read and edited only by proprietary word processors, SGML or XML for which the DTD and/or processing tools are not generally available, and the machine-generated HTML, PostScript or PDF produced by some word processors for output purposes only.

The “Title Page” means, for a printed book, the title page itself, plus such following pages as are needed to hold, legibly, the material this License requires to appear in the title page. For works in formats which do not have any title page as such, “Title Page” means the text near the most prominent appearance of the work’s title, preceding the beginning of the body of the text.

A section “Entitled XYZ” means a named subunit of the Document whose title either is precisely XYZ or contains XYZ in parentheses following text that translates XYZ in another language. (Here XYZ stands for a specific section name mentioned below, such as “Acknowledgements”, “Dedications”, “Endorsements”, or “History”.) To “Preserve the Title” of such a section when you modify the Document means that it remains a section “Entitled XYZ” according to this definition.

The Document may include Warranty Disclaimers next to the notice which states that this License applies to the Document. These Warranty Disclaimers are considered to be included by reference in this License, but only as regards disclaiming warranties: any other implication that these Warranty Disclaimers may have is void and has no effect on the meaning of this License.

2. VERBATIM COPYING

You may copy and distribute the Document in any medium, either commercially or noncommercially, provided that this License, the copyright notices, and the license notice saying this License applies to the Document are reproduced in all copies, and

that you add no other conditions whatsoever to those of this License. You may not use technical measures to obstruct or control the reading or further copying of the copies you make or distribute. However, you may accept compensation in exchange for copies. If you distribute a large enough number of copies you must also follow the conditions in section 3.

You may also lend copies, under the same conditions stated above, and you may publicly display copies.

3. COPYING IN QUANTITY

If you publish printed copies (or copies in media that commonly have printed covers) of the Document, numbering more than 100, and the Document's license notice requires Cover Texts, you must enclose the copies in covers that carry, clearly and legibly, all these Cover Texts: Front-Cover Texts on the front cover, and Back-Cover Texts on the back cover. Both covers must also clearly and legibly identify you as the publisher of these copies. The front cover must present the full title with all words of the title equally prominent and visible. You may add other material on the covers in addition. Copying with changes limited to the covers, as long as they preserve the title of the Document and satisfy these conditions, can be treated as verbatim copying in other respects.

If the required texts for either cover are too voluminous to fit legibly, you should put the first ones listed (as many as fit reasonably) on the actual cover, and continue the rest onto adjacent pages.

If you publish or distribute Opaque copies of the Document numbering more than 100, you must either include a machine-readable Transparent copy along with each Opaque copy, or state in or with each Opaque copy a computer-network location from which the general network-using public has access to download using public-standard network protocols a complete Transparent copy of the Document, free of added material. If you use the latter option, you must take reasonably prudent steps, when you begin distribution of Opaque copies in quantity, to ensure that this Transparent copy will remain thus accessible at the stated location until at least one year after the last time you distribute an Opaque copy (directly or through your agents or retailers) of that edition to the public.

It is requested, but not required, that you contact the authors of the Document well before redistributing any large number of copies, to give them a chance to provide you with an updated version of the Document.

4. MODIFICATIONS

You may copy and distribute a Modified Version of the Document under the conditions of sections 2 and 3 above, provided that you release the Modified Version under precisely this License, with the Modified Version filling the role of the Document, thus licensing distribution and modification of the Modified Version to whoever possesses a copy of it. In addition, you must do these things in the Modified Version:

- A. Use in the Title Page (and on the covers, if any) a title distinct from that of the Document, and from those of previous versions (which should, if there were any, be listed in the History section of the Document). You may use the same title as a previous version if the original publisher of that version gives permission.

- B. List on the Title Page, as authors, one or more persons or entities responsible for authorship of the modifications in the Modified Version, together with at least five of the principal authors of the Document (all of its principal authors, if it has fewer than five), unless they release you from this requirement.
- C. State on the Title page the name of the publisher of the Modified Version, as the publisher.
- D. Preserve all the copyright notices of the Document.
- E. Add an appropriate copyright notice for your modifications adjacent to the other copyright notices.
- F. Include, immediately after the copyright notices, a license notice giving the public permission to use the Modified Version under the terms of this License, in the form shown in the Addendum below.
- G. Preserve in that license notice the full lists of Invariant Sections and required Cover Texts given in the Document's license notice.
- H. Include an unaltered copy of this License.
- I. Preserve the section Entitled "History", Preserve its Title, and add to it an item stating at least the title, year, new authors, and publisher of the Modified Version as given on the Title Page. If there is no section Entitled "History" in the Document, create one stating the title, year, authors, and publisher of the Document as given on its Title Page, then add an item describing the Modified Version as stated in the previous sentence.
- J. Preserve the network location, if any, given in the Document for public access to a Transparent copy of the Document, and likewise the network locations given in the Document for previous versions it was based on. These may be placed in the "History" section. You may omit a network location for a work that was published at least four years before the Document itself, or if the original publisher of the version it refers to gives permission.
- K. For any section Entitled "Acknowledgements" or "Dedications", Preserve the Title of the section, and preserve in the section all the substance and tone of each of the contributor acknowledgements and/or dedications given therein.
- L. Preserve all the Invariant Sections of the Document, unaltered in their text and in their titles. Section numbers or the equivalent are not considered part of the section titles.
- M. Delete any section Entitled "Endorsements". Such a section may not be included in the Modified Version.
- N. Do not retitle any existing section to be Entitled "Endorsements" or to conflict in title with any Invariant Section.
- O. Preserve any Warranty Disclaimers.

If the Modified Version includes new front-matter sections or appendices that qualify as Secondary Sections and contain no material copied from the Document, you may at your option designate some or all of these sections as invariant. To do this, add their titles to the list of Invariant Sections in the Modified Version's license notice. These titles must be distinct from any other section titles.

You may add a section Entitled “Endorsements”, provided it contains nothing but endorsements of your Modified Version by various parties—for example, statements of peer review or that the text has been approved by an organization as the authoritative definition of a standard.

You may add a passage of up to five words as a Front-Cover Text, and a passage of up to 25 words as a Back-Cover Text, to the end of the list of Cover Texts in the Modified Version. Only one passage of Front-Cover Text and one of Back-Cover Text may be added by (or through arrangements made by) any one entity. If the Document already includes a cover text for the same cover, previously added by you or by arrangement made by the same entity you are acting on behalf of, you may not add another; but you may replace the old one, on explicit permission from the previous publisher that added the old one.

The author(s) and publisher(s) of the Document do not by this License give permission to use their names for publicity for or to assert or imply endorsement of any Modified Version.

5. COMBINING DOCUMENTS

You may combine the Document with other documents released under this License, under the terms defined in section 4 above for modified versions, provided that you include in the combination all of the Invariant Sections of all of the original documents, unmodified, and list them all as Invariant Sections of your combined work in its license notice, and that you preserve all their Warranty Disclaimers.

The combined work need only contain one copy of this License, and multiple identical Invariant Sections may be replaced with a single copy. If there are multiple Invariant Sections with the same name but different contents, make the title of each such section unique by adding at the end of it, in parentheses, the name of the original author or publisher of that section if known, or else a unique number. Make the same adjustment to the section titles in the list of Invariant Sections in the license notice of the combined work.

In the combination, you must combine any sections Entitled “History” in the various original documents, forming one section Entitled “History”; likewise combine any sections Entitled “Acknowledgements”, and any sections Entitled “Dedications”. You must delete all sections Entitled “Endorsements.”

6. COLLECTIONS OF DOCUMENTS

You may make a collection consisting of the Document and other documents released under this License, and replace the individual copies of this License in the various documents with a single copy that is included in the collection, provided that you follow the rules of this License for verbatim copying of each of the documents in all other respects.

You may extract a single document from such a collection, and distribute it individually under this License, provided you insert a copy of this License into the extracted document, and follow this License in all other respects regarding verbatim copying of that document.

7. AGGREGATION WITH INDEPENDENT WORKS

A compilation of the Document or its derivatives with other separate and independent documents or works, in or on a volume of a storage or distribution medium, is called

an “aggregate” if the copyright resulting from the compilation is not used to limit the legal rights of the compilation’s users beyond what the individual works permit. When the Document is included in an aggregate, this License does not apply to the other works in the aggregate which are not themselves derivative works of the Document.

If the Cover Text requirement of section 3 is applicable to these copies of the Document, then if the Document is less than one half of the entire aggregate, the Document’s Cover Texts may be placed on covers that bracket the Document within the aggregate, or the electronic equivalent of covers if the Document is in electronic form. Otherwise they must appear on printed covers that bracket the whole aggregate.

8. TRANSLATION

Translation is considered a kind of modification, so you may distribute translations of the Document under the terms of section 4. Replacing Invariant Sections with translations requires special permission from their copyright holders, but you may include translations of some or all Invariant Sections in addition to the original versions of these Invariant Sections. You may include a translation of this License, and all the license notices in the Document, and any Warranty Disclaimers, provided that you also include the original English version of this License and the original versions of those notices and disclaimers. In case of a disagreement between the translation and the original version of this License or a notice or disclaimer, the original version will prevail.

If a section in the Document is Entitled “Acknowledgements”, “Dedications”, or “History”, the requirement (section 4) to Preserve its Title (section 1) will typically require changing the actual title.

9. TERMINATION

You may not copy, modify, sublicense, or distribute the Document except as expressly provided for under this License. Any other attempt to copy, modify, sublicense or distribute the Document is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

10. FUTURE REVISIONS OF THIS LICENSE

The Free Software Foundation may publish new, revised versions of the GNU Free Documentation License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns. See <http://www.gnu.org/copyleft/>.

Each version of the License is given a distinguishing version number. If the Document specifies that a particular numbered version of this License “or any later version” applies to it, you have the option of following the terms and conditions either of that specified version or of any later version that has been published (not as a draft) by the Free Software Foundation. If the Document does not specify a version number of this License, you may choose any version ever published (not as a draft) by the Free Software Foundation.

16.2.1 ADDENDUM: How to use this License for your documents

To use this License in a document you have written, include a copy of the License in the document and put the following copyright and license notices just after the title page:

```
Copyright (C)  year  your name.
Permission is granted to copy, distribute and/or modify this document
under the terms of the GNU Free Documentation License, Version 1.2
or any later version published by the Free Software Foundation;
with no Invariant Sections, no Front-Cover Texts, and no Back-Cover
Texts.  A copy of the license is included in the section entitled ‘‘GNU
Free Documentation License’’.
```

If you have Invariant Sections, Front-Cover Texts and Back-Cover Texts, replace the “with...Texts.” line with this:

```
with the Invariant Sections being list their titles, with
the Front-Cover Texts being list, and with the Back-Cover Texts
being list.
```

If you have Invariant Sections without Cover Texts, or some other combination of the three, merge those two alternatives to suit the situation.

If your document contains nontrivial examples of program code, we recommend releasing these examples in parallel under your choice of free software license, such as the GNU General Public License, to permit their use in free software.

17 Glossary

BMC	[B]aseboard [M]anagement [C]ontroller.
FISH	[F]ree[I]PMI [SH]ell.
GNU	[G]NU's [N]ot [U]nix.
GPL	GNU [G]eneral [P]ublic [L]icense.
IP	[I]nternet [P]rotocol.
IPMI	[I]ntelligent [P]latform [M]anagement [I]nterface
NIS	[N]etwork [I]nformation [S]ervice. Also humerously known as [N]etwork [I]ntrusion [S]ervice :) .
RMCP	[R]empote [M]anagement [C]ontrol [P]rotocol.
RSH	[R]emote [SH]ell.

Concept index

•		fish.scm	5
./configure	2	FreeIPMI SHell	5
/			
/usr/sbin/fish	6		
B		G	
bmc-config configuration file	8	Guile	2
bmc-watchdog.log	61		
C		I	
Cat ate the fish	78	Introduction to the GNU FreeIPMI system	1
CDC 6440	17	io-port	61
Copying	82	IPC key conflict	79
E		P	
Extensions	7	Ports conflict	78
F		powerman	73
FDL, GNU Free Documentation License	88		
Fencing BMC	78	R	
fish	5	Readline	2
Fish exception	78		
fish options	5	S	
		sensors-conf.scm	16
		SR870BN4	17
		T	
		Thunder	17

Program index

B

bmc-config	8
bmc-info	15
bmc-watchdog	61

F

fish	5
------------	---

I

ipmiping	74
ipmipower	66

L

libfreeipmi	4
-------------------	---

P

powerman	73
----------------	----

R

rmcpping	76
----------------	----

S

sel	58
sensors	16